MODERN Machine Shop
July, 1938

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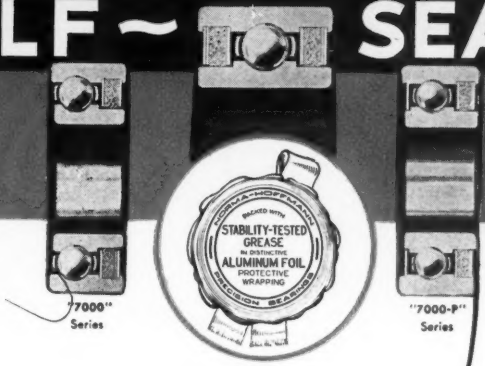

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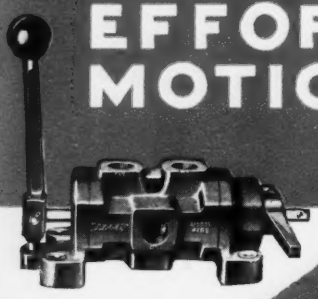

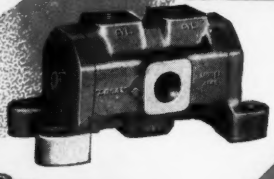

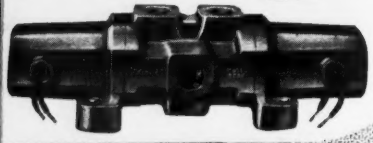

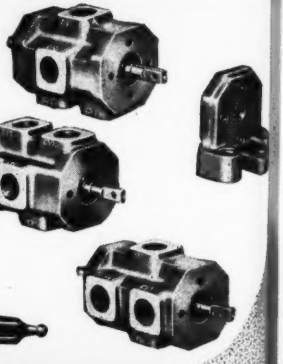

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Volume 11 | July, 1938 | Number 2

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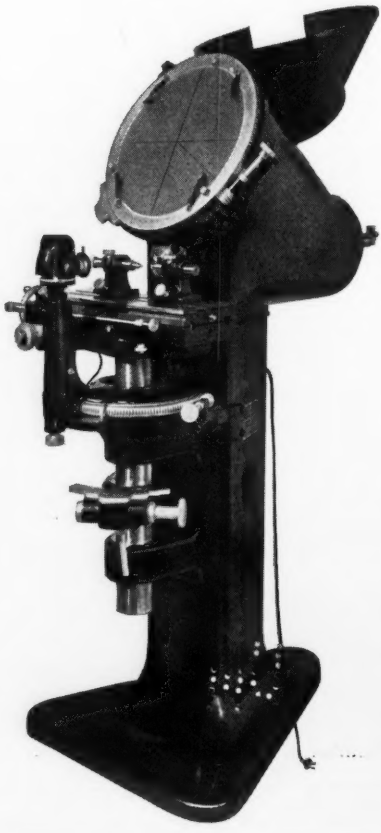

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MODERN Machine Shop

CINCINNATI, OHIO

JULY, 1938 VOL. 11, No. 2

Processing Parts for Lockheed Hydraulic Brake

A number of interesting production operations are presented in this article

By HOWARD CAMPBELL

IN considering the efficiency of the modern automobile, first thought is usually given to the power plant and the running qualities with little—if any—thought concerning the stopping qualities. However, in these days when the automobile is the common method of transportation and high speeds are the rule, the ability to stop when and as necessary is as important as the ability to start. Sometimes, indeed, it is much more important, and every day of the year the saving of many lives can be credited to efficient brakes.

A large number of present-day

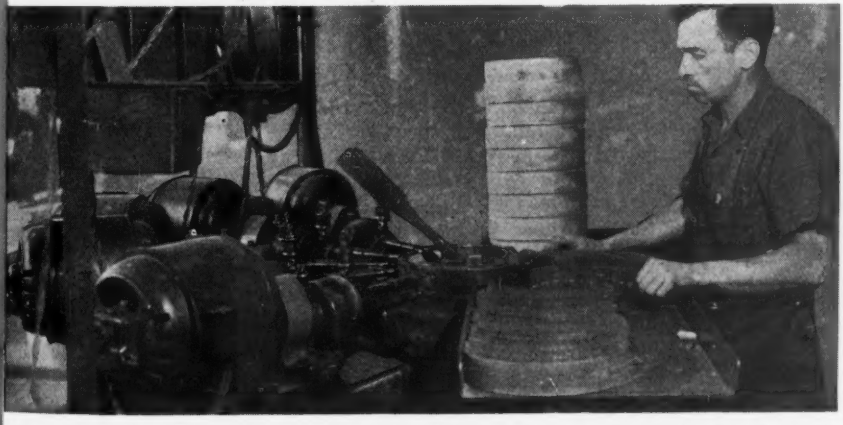


Fig. 1—Drilling and Counterboring Hydraulic Brake Shoes and Brake Facing for Riveting.

automobiles of the better class are equipped with Lockheed Hydraulic Brakes—the original hydraulic brake. These brakes are manufactured in the plant of the Wagner Electric Corporation, St. Louis, Missouri. Through the courtesy of this corporation, we are privileged to present here some of the more interesting operations in the manufacture of parts for the Lockheed brake.

The braking system consists primarily of a master cylinder filled with brake fluid, tubing which carries the fluid to the individual wheel brakes, the cylinders and pistons which actuate the individual brake shoes, and the shoes for each wheel, consisting of two shoes which are expanded by the pressure exerted by the hydraulic piston. To afford the traction necessary, each brake shoe is faced with brake lining, the lining being held to the shoe by rivets. The operation of drilling and countersinking the holes for these rivets is shown in the illustration Fig. 1.

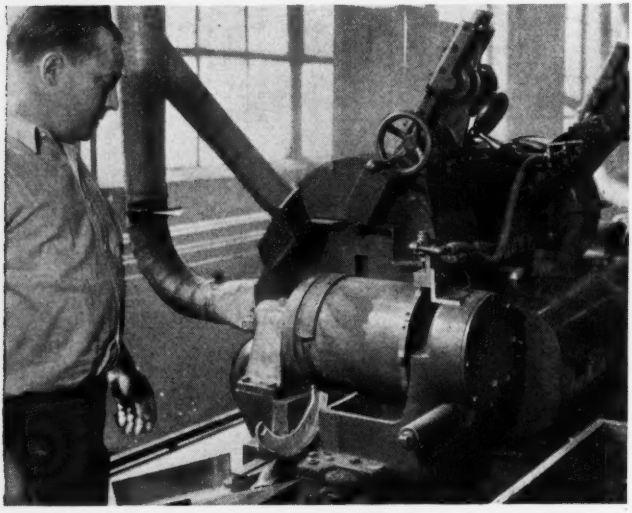


Fig. 2—The drum clamps the brake shoe and revolves it while the brake shoe facing is being finished to the proper thickness by grinding in this Gardner grinder.

The machine used for this operation is a Natco 12-spindle drilling machine, each pair of spindles being powered by an individual motor as shown. The six motors are grouped on a radius so that the holes will be drilled in pairs around the radius of the shoe. The operator places two shoes, with the facing for each, inside a circular jig where they are clamped by pressure exerted from the center of the jig. When ready to drill, the operator throws a lever which connects the feeding mechanism and the 12 spindles all move toward the center, drilling and counterboring the twelve ⅛-in. holes simultaneously. While the shoe and lining are being drilled, another shoe and piece of lining is being loaded. A shoe is drilled at every half turn of the jig. At a predetermined depth the feed reverses and the spindles recede by rapid traverse. The two pieces are released and replaced, and the operation is repeated. Production on this operation is very rapid.

The brake shoe facing must be absolutely smooth and on an even radius, this result being obtained by grinding the facing on the Gardner grinder shown in Fig. 2. The feature of this machine is the fixture in which the brake shoe is held and revolved while the grinding operation is in process. The fixture consists of a drum with

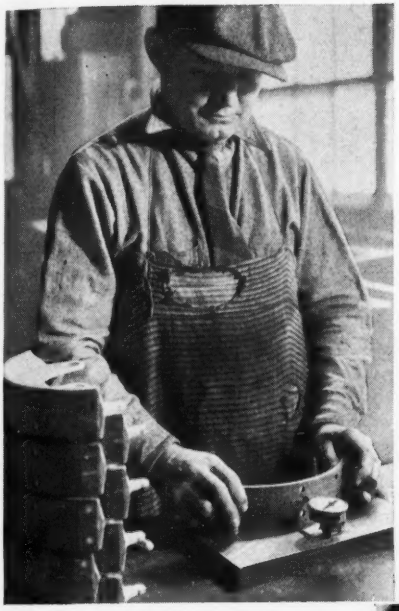
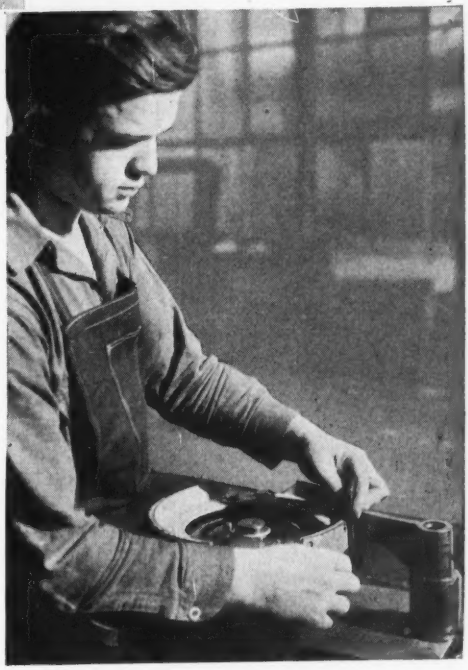


Fig. 3—(Above) Each brake shoe is tested for symmetry. Fig. 4—(Right) The face of the shoe must not taper more than 0.006 inch.

detached head—or perhaps we should say a pair of drums—a slot being provided between the two parts into which the web of the shoe is slipped. The drum revolves continuously and upon reaching a point in its revolution where the end of the shoe facing is about to engage the grinding wheel, a cam at the near end of the drum engages a cam roller which forces it to the left, closing the gap and gripping the web of the shoe so that it will be held firmly while the grinding operation is taking place. The direction of the drum is such that the shoe is fed downward on the side in contact with the grinding wheel.

As the grinding operation is completed and the end of the shoe clears the grinding wheel, the cam-actuated movable end of the drum recedes, freeing the shoe so that it can fall out and drop onto the slide provided for the purpose. The illustration shows a shoe in the drum just about to engage the grinding wheel and another one on the slide where it has just left the drum.

A maximum of 1/64 in. of material is removed from the facing on this operation. The machine is double, thus production can be doubled by having an operator at each end of the machine. The section of tubing connected to the shop air line is so arranged that a jet of air blows intermittently while shoe and lining are being ground. The main purpose of this air jet is to blow the accumulated dust from the rivet holes so that this will not later fall out when



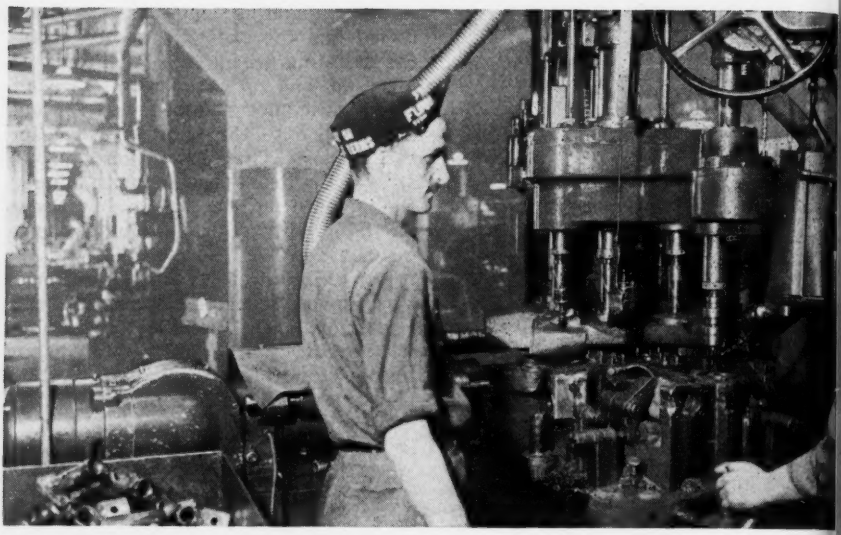
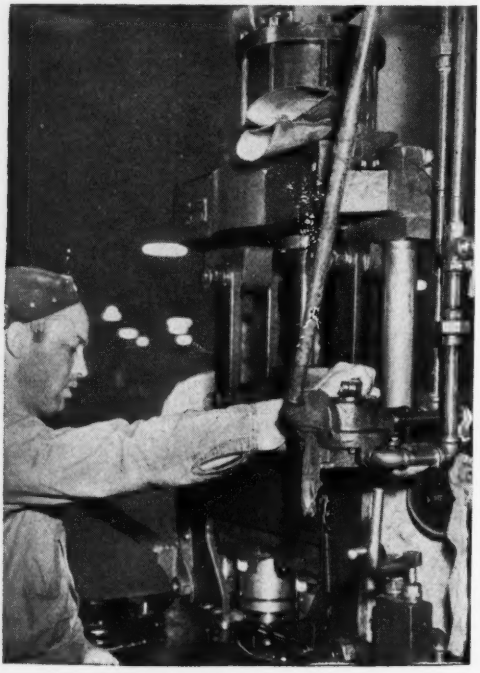


Fig. 5—The feature of this operation is the auxiliary drilling unit, which spot faces a hub while the other operations are in process.



the shoe is being set to the brake drum.

After finishing the brake facing to size by grinding as described in the previous paragraph, the shoes are inspected in the fixture shown in use in Fig. 3. This fixture consists of a surface plate, as shown, upon the surface of which is anchored a curved steel rib which serves as a guide for the rim of the brake shoe as it is moved past the dial indicator. Thus the exact thickness of the web and facing together is instantly determined. The face of the shoe must be square with the mounting surface and must be symmetrical within a tolerance of 0.006 inch.

Whether or not the face of the

Fig. 6—In this machine pneumatic and hydraulic forces are employed in opposition to each other. The machine is punching holes in a hydraulic brake dust shield.

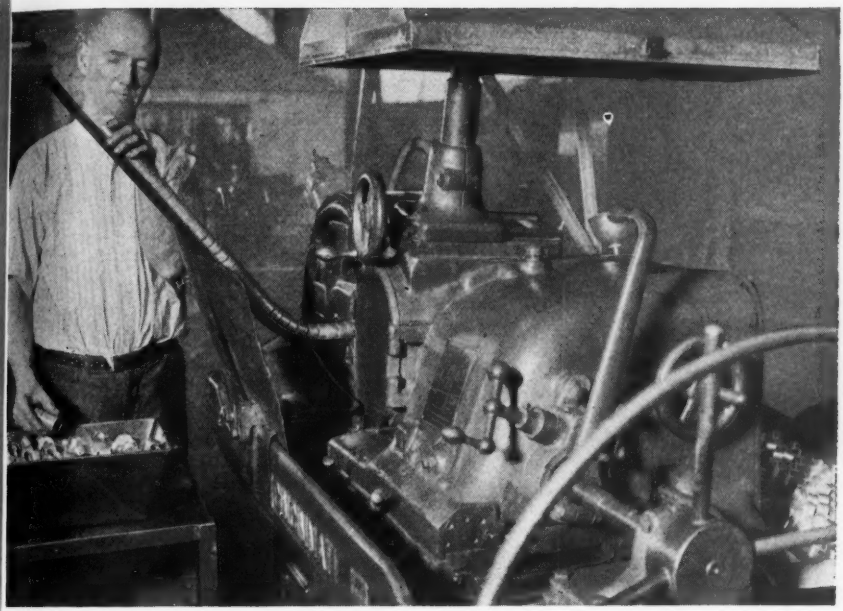


Fig. 7—Aluminum pistons 3/4 in. long by 1¼ in. diameter are ground in this centerless grinder.

shoe is square with the web is determined by the use of the fixture shown in Fig. 4. The "square" swings on a vertical post so that it can be brought into contact with the face and swung away again with a quick motion. The square is short enough to allow a small gap between the end of the square and the face of the shoe; thus the amount of taper—if any—can be determined by inserting a shim between the square and the face of the shoe at both top and bottom as shown. A taper of 0.006 in. is the limit on this operation.

The operation of drilling, facing and tapping a 1¼-in. hole in the master cylinder is shown in process in Fig. 5, a Barnes multiple drill and Kingsbury drilling unit being used for this operation. This is a five-spindle machine, and each piece makes the circuit twice. In the first operation a 1¼-in. hole is drilled, faced and tapped for a Welch plug. In the second operation another hole is drilled, faced and tapped and the Welch plug hole is spot faced by means of the Kingsbury unit shown at the left of the illustration. The interesting thing about this operation is the manner in which an auxiliary unit is employed to perform an extra operation at right angles to the machine spindle.

Dust shields are riveted in the press shown in Fig. 6 in which pneumatic and hydraulic power are employed in opposition to each other. The shield is placed in position on the cylinder which raises it to a predetermined height during which two heavy springs are compressed so that cams will slip over milled flats on cam studs. When the cams are in place, the top air fixture then comes down and swedges the flats of the

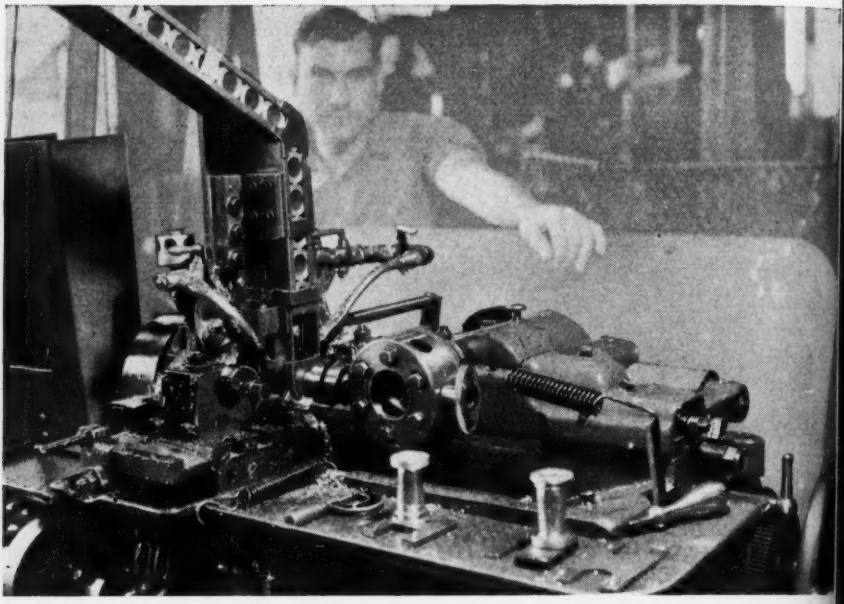


Fig. 8—Each piece is chucked mechanically, providing for maximum production of seven and one-half pieces per minute.

stud-holding cam securely in place.

The hydraulic pistons for the wheel cylinders, made of aluminum, are ground to size in the Cincinnati centerless grinder shown in operation in Fig. 7. As shown, the pistons are fed to the grinding wheels by gravity. Each piston is ¾ in. long by 1¼ in. diameter and approximately 0.005 in. of stock is removed in the grinding operation.

Pistons for the master cylinders, which are 1½-in. diameter, are turned, chamfered and faced in the Brown & Sharpe automatic screw machine illustrated in Fig. 8. Two form tools are used for this operation, one at the front and one at the back, and the machine is equipped with magazine feed to insure the maximum production. The interesting feature of this set-up is the magazine, the work being fed to the chuck by gravity and being actually chucked by the aid of a finger in the machine turret.

The machine is shown with the turret forward and the finger holding the workpiece while it is in process of being chucked. After chucking, the turret recedes and the magazine lifts so that the tools can proceed with the machining operation. Upon completion of the machining, the tool blocks move back out of the way and the chuck is opened automatically, allowing the workpiece to fall out. An instant later the magazine slides down, carrying a single workpiece with it and holding it directly in front of the chuck. The turret then moves forward, the finger pushing the workpiece into the chuck and holding it while the chuck jaws tighten. The turret then recedes, the magazine lifts, and the machining operation is repeated.

The operation is performed faster than it possibly could be done by

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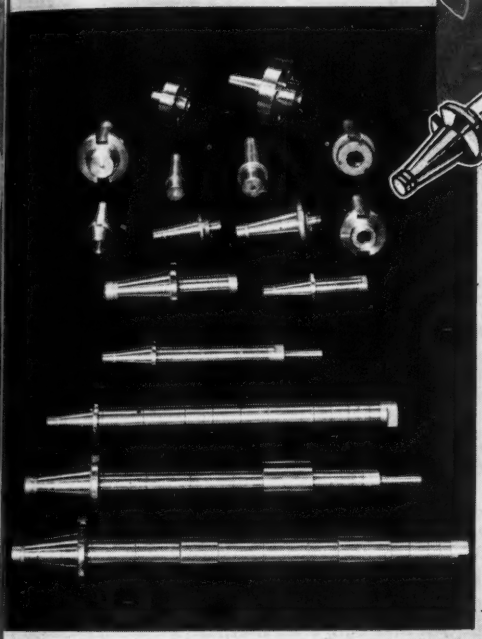

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hand, and the operator is left free to keep the magazine filled and keep the tools in condition. The fact that the operator is not required to devote his entire time to the machine means that the operation can continue without interruption. Production on this operation is seven and one-half pieces per minute.

BOOKS

Natural Laws Applied to Production. This book, containing 32 pages 8½x11 in. in size, comprises a history of the development of the modern factory and shows how, by working together as a group in an efficient manner instead of singly, a given number of men can increase their productive efficiency in direct ratio to the size of the group. The book contains eight chapters as follows: 1—Facts vs. Principle. 2—The Law of Least Action. 3—Functional Sequence. 4—The Laws of Production. 5—The Laws of Materials Handling. 6—The Function of Management. 7—"From Here On." 8—Basic Elements of a Conveyer System.

In addition to these eight chapters, the book presents diagrams to illustrate the various types of conveyors and their relation to movement, together with several pages of illustrations showing the different kinds and types of conveyors used for handling a wide variety of materials through the sequences of manufacturing operations. The book should be of prime interest to anyone who is concerned with the modernization of manufacturing methods. Copy free to any mechanical executive upon application to Mathews Conveyer Company, Ellwood City, Pennsylvania.

Machining Aluminum and Aluminum Alloys. This 32-page book contains a fund of information for manufacturing executives in plants in which the product is composed in whole or in part of aluminum. Beginning with general directions concerning the rake and angles used in grinding tools for cutting aluminum, the book carries the reader through three divisions under the headings of General Machining Practice, Automatic Screw-Machine Practice, and General Tables of Information. The first division deals with tool shapes in general, rakes, clearances and angles, and then discusses lathe tools, planer and shaper tools, milling cutters, threading tools, twist drills, reamers, saws, files, cutting speeds and feeds, cutting compounds, grinding wheels and finishes. Part II deals with stock for automatic screw-machine work, instructions for drilling various kinds and depths of holes, form and cut-off tools, box tools, threading tools, speeds and feeds, and cutting compounds. The third section contains five tables which will be of use to anyone working on aluminum.

A copy of this book can be had by readers of MODERN MACHINE SHOP who will address their request to Aluminum Company of America, Pittsburgh, Pennsylvania.

Timken Bearings for Oil Field Equipment. Designers and builders of all types of equipment used in the oil fields will be interested in the new 52-page supplement to the Timken Engineering Journal. This supplement, which is punched for filing in the standard 8½x11 in. three ring binder, describes and illustrates the various applications of single and double row bearings to steam, gasoline and diesel engines, clutches, draw works, transmissions, rotaries, hooks, swivels, blocks, and sheaves, geared pumps, pumping units, geared and band wheel pumping powers, pitmans and other miscellaneous equipment commonly used in connection with oil drilling and pumping operations. Special recommendations are given for gasoline, diesel and semi-diesel crankshaft bearings on the basis of explosion pressure and normal engine speed.

Copies free upon request to Timken Roller Bearing Company, Canton, Ohio.

Available Raw Materials for a Pacific Coast Iron Industry—Volume V. By Edwin T. Hodge, Consulting Geologist. Published January, 1938, by the War Department, Office of the Division Engineer, North Pacific Division, 523 Pittock Block, Portland, Oregon. Volume V price $1.00. (Mimeographed, 106 pages, 12 plates, and 2 tables.) (Four volumes previously published, price $5.00. Price of complete set of five volumes, $6.00.)

This volume is an addition to those already published. It describes many iron ore deposits located in Washington, Idaho, and Oregon, giving the geology and grade of the ore, with analyses. The present need of the Pacific Northwest market for iron reduction plants and possible methods of reduction are outlined. A feature is a description of the Ruzicka process for making metallurgical coke from wood, with the by-products obtainable.

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Time Study Methods

By G. A. Baeslack
Manufacturing Engineer, Westinghouse Elec. & Mfg. Co.

Computations and Conclusions

The working up of the study consists in finding the elapsed elemental time values which is done by subtracting the figures on the same line of adjacent columns headed "R" and recording the remainders in the corresponding spaces of the columns headed "T." The elapsed time for the first occurrence in column "1" will, of course, be the same as the observed reading because the watch started from zero, and that for the second element will be the remainder obtained by subtracting the column "1" observation from the column "2" observation, and so on, as illustrated in Fig. 3.

Where a letter "M" indicates that the observer missed an element, that element must be ignored as well as the first observation value immediately following, as there is no reading to be subtracted from it. If a space contains two readings separated by a horizontal line, which indicates an irregularity in sequence, the elapse time is found by subtracting the lowe reading from the upper.

In case a symbol indicating a for eign element is encountered, then th corresponding symbol in the reserve space at the right hand side of th sheet must be located. By subtractio the elapsed time o the foreign elemen is found and this i then deducted fro the difference be tween the two adj cent readings when the symbol first ap peared, the remain der being the elapse time for the regula element. The sub traction procedure i followed by an in spection of the re mainders for th purpose of deletin values that appe to be abnormal excessively high, low, as compare with the other va

Skill			Effort		
+0.15 +0.13	A1 A2	Superskill	+0.13 +0.12	A1 A2	Killing
+0.11 +0.08	B1 B2	Excellent	+0.10 +0.06	B1 B2	Excellent
+0.06 +0.03	C1 C2	Good	+0 05 +0.02	C1 C2	Good
0.00	D	Average	0.00	D	Average
−0.05 −0.10	E1 E2	Fair	−0.04 −0.08	E1 E2	Fair
−0 16 −0.22	F1 F2	Poor	−0.12 −0.17	F1 F2	Poor
Conditions			**Consistency**		
+0.06	A	Ideal	+0.04	A	Perfect
+0.04	B	Excellent	+0.03	B	Excellent
+0 02	C	Good	+0.01	C	Good
0 00	D	Average	0 00	D	Average
−0 03	E	Fair	−0 02	E	Fair
−0 07	F	Poor	−0 04	F	Poor

Fig. #6 Performance-rating table.

in a Modern Plant

(Concluding Section)

ues of the same elements. Such values are indicated by drawing a circle around each one.

The total number of normal occurrences of each element in the study is then counted (the missed occurrences and abnormal values are excluded) and the resultant number entered in the summary line marked "No Observations" at the tops of the respective summary columns for each element. Then all the resultant elapsed time values for each element are added up and the sum recorded in the space marked "Totals T" in the respective summary column for each element.

Each sum is divided by the number of occurrences shown in the space immediately below that for the totals, and each quotient is written into the corresponding summary space marked "Average Time." In addition it is sometimes advisable to record the resultant minimum and maximum normal elemental time values in the indicated spaces of the corresponding summary columns, to be available for reference purposes, as shown in Fig. 3 (June, 1938, issue).

To develop the "Leveling Factor," the application of which brings the ultimate time allowance within the

INSTRUCTION SHEET

Operation: Face, Point, Turn and Thread Short End of Stud | Sec. F-1

Part: Stud for Type 214A | Time Study: G.B.J. #1 12-2-36.

Control Box | Dwg. 285792 | Sub. 8

Mach. Tool: #5 Warner & Swasey | Ham

Turret Lathe | L. Spec. | Sub.

Special Tools: Pointing Tool J4452 | Ins. Spec. | Sub.

Chamfering Tool J4453

Sketch of Part and Set Up

Supply: Tools and Material Furnished by Supply Boy under Direction of Foreman

Inspection: Must pass thread gage and be free from burrs.

Remarks

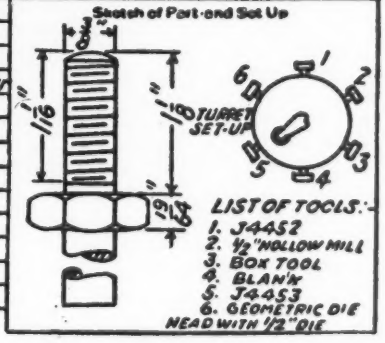


Fig. 7—Instruction Sheet for Operators and Supervisors

capacity of the average operator, the time study man consults the "Performance Rating Table" shown in Fig. 6. The elemental numerical rating factors of this table are the result of intensive studies of the relative performances of many operators having varying degrees of skill and application, and working under a variety of conditions.

The time study man selects from the Performance Rating Table the numerical elemental leveling values which correspond to the indicated evaluation of the operator's performance, with regard to skill, effort, operating conditions and consistency of execution. These values are recorded in the specified spaces at the lower right hand corner of the front of the time study sheet, as illustrated in Fig. 3.

Care must be taken that each elemental leveling value is preceded by the correct plus or minus sign, because the ultimate leveling factor consists of the algebraic sum of all these values added to unity (1.0). This algebraic sum is then recorded in the first space of the summary line marked "Leveling Factor" on the front page of the summary item study sheet, and the checked off leveling symbols are noted in the line immediately above the "Leveling Factor" line.

Each average time element is then multiplied by this leveling factor and each product recorded in the respective space provided in the summary line marked "Standard Time." To each of these elemental Standard Time values is then added a certain percentage allowance to take care of the operator's personal requirements, fatigue, unavoidable delays, and now and then a special allowance must be made, when the work requires exceptional physical exertion, or exposure to high temperature during a considerable portion of each operating cycle.

Extensive analytical studies of the effects of these causes upon the pe formance rates of a variety of ope ators engaged in various classes work have resulted in establishing t following allowance factors for ge eral machine tool and bench oper tors:

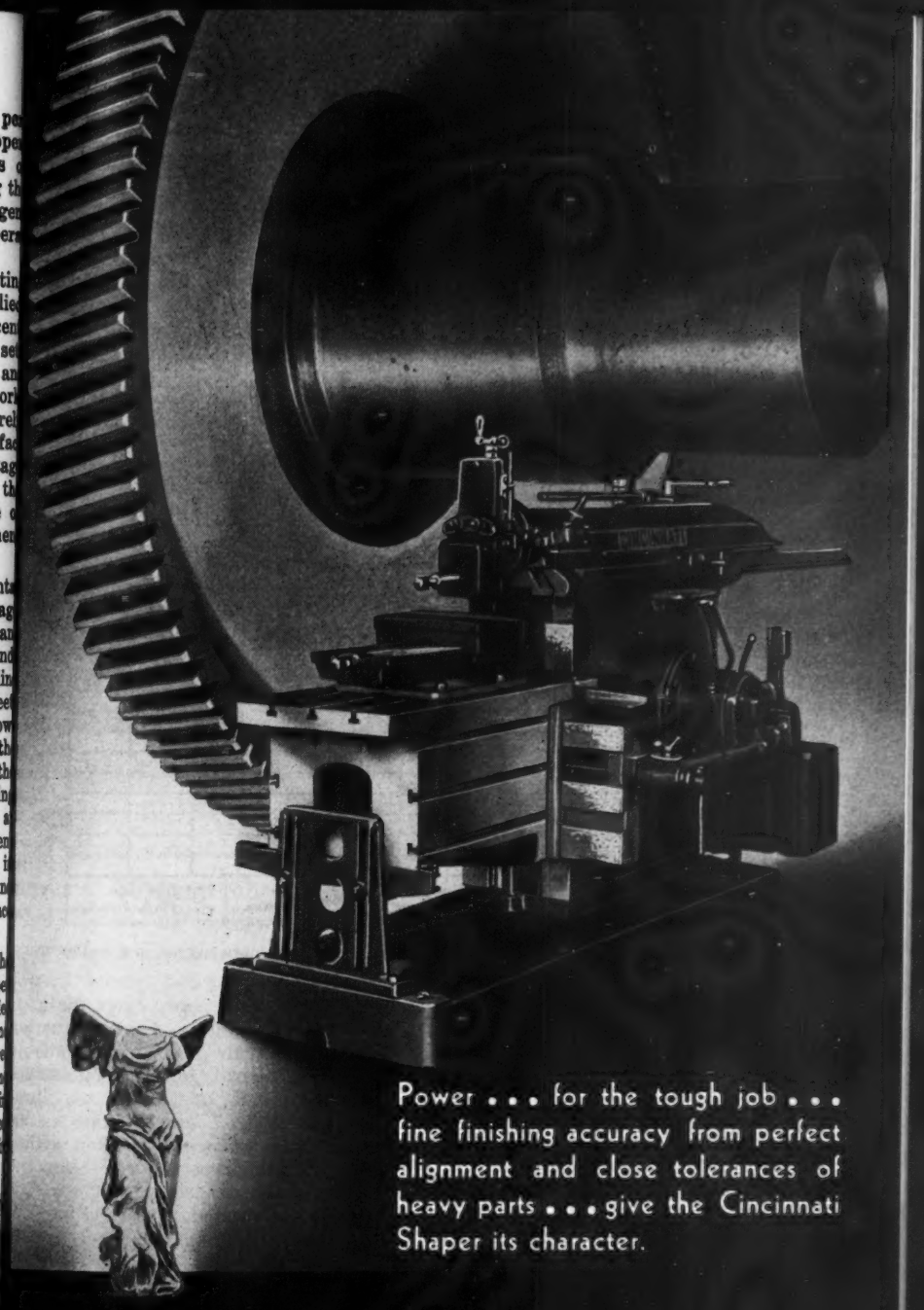
For machining time, actual cuttin operations with power feed applie the allowance factor is 10 per cen For machine handling elements se ting up of machine jobs, light an medium assembling jobs, bench wor packing, painting and other purel manual operations, the allowance fa tor is 15 per cent. These percentag allowances are then indicated in t "Per Cent Allowance" line space each respective operation eleme column.

Each Standard Time element value is multiplied by its percentag allowance factor and each resultan product is written in the correspond ing space in the "Time Allowed" lin at the bottom of the time study shee Fig. 3. Each elemental time allow ance is then transcribed in ink on th back of the same sheet and on th same line where the correspondin element is listed, in the last column the right hand side if the eleme occurs only once in the cycle, and i the third column from the right han side when it occurs more than onc per cycle.

In the adjacent column is noted th number which indicates the numbe of occurrences of any particular el ment; the product of this number an the elemental allowed time is then re corded in the total elemental tim column. The sum of all the values i the latter column is the time allowe per operation cycle as shown Fig. 4.

Derivation of Set-Up Time Allowan

To completely time study a job, Set-up Time Allowance must be e tablished. This allows time for t necessary preliminary operations



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operator must usually perform before the actual repetitive elemental processing operations can be performed on each piece, and it also allows time for the operations incident to the termination of the job in order to "clear the deck" for the next job.

Collecting the data for an adequate and just Set-up Time Allowance involves the same procedure of discriminating analysis and time study of the various essential preliminary elemental operations, and of those required to terminate the job, as that followed when making the detail time study of the processing cycle of the individual units comprising a job.

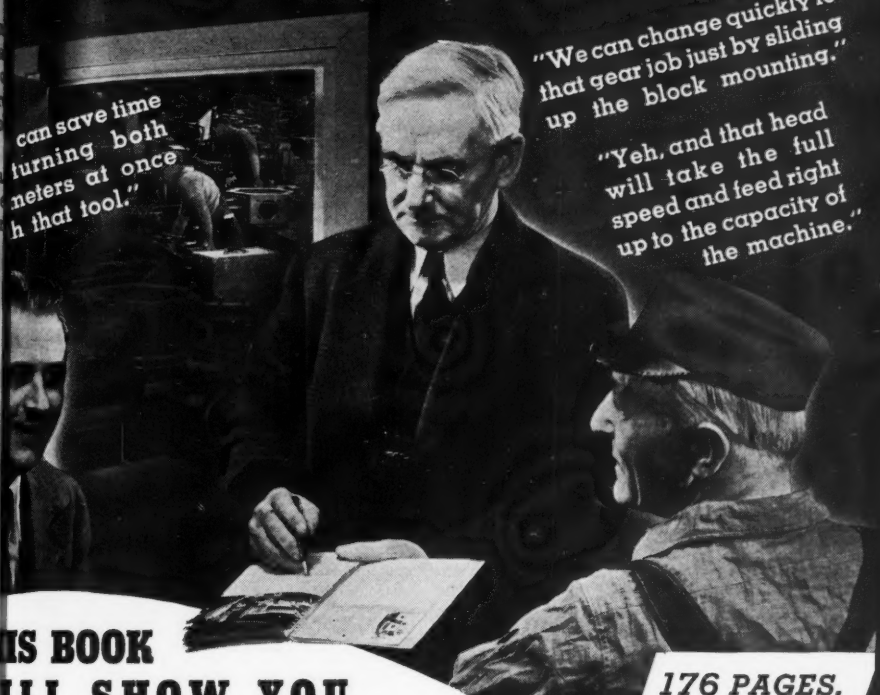
The time study man divides the setting-up and subsequent dismantling operations into distinctive well defined elemental operations, which are later coordinated into standardized elemental set-up data so that these time values will be available for compiling correct partial set-up time allowances whenever operators work similar jobs where only a partial arranging of the equipment and tool is required.

The set-up and each piece time allowances are recorded in the space shown in Fig. 5, and the pertinent

No.	Order of Operations	Turret Sym.	Tools	Depth of Cut	Speed RPM	Feed IN. PER MIN.
1	Get stud from table & place in chuck					
2	Tighten chuck with socket wrench					
3	Start machine					
4	Face stud		J4452	1/8"	900	Hand
5	Turn turret-one position					
6	Point stud		Hollow Mill	1/32	900	Hand
5	Turn turret-one position					
7	Turn stud		Box Tool	1/32	900	430
8	Turn turret-two positions					
9	Chamfer Hex.		J4453	1/8"	900	Hand
5	Turn turret-one position					
10	Thread stud		AUTOMATIC KNOCK-OFF DIE	-	300	—
5	Turn turret-one position					
11	Stop machine					
12	Remove stud & place in tote pan					
	Date 12/2/36. A.B. Section		J.L. Foreman		Approved Superintendent	

Fig. 8—Reverse side of Instruction Sheet giving method of job procedure, speeds, and tool number

set-up and operation cycle data posted on both sides of an instruction sheet to provide a readily available procedure record for the immediate supervisor and operators, as illustrated in Fig. 7 and 8. The established time values are then either transcribed onto record cards for the Cost and Production Department files, to be applied to the processing of the respective parts in the specified manner under a wage incentive plan and also to be available for cost estimating, or the elemental allow


can save time
turning both
meters at once
h that tool."
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"Yeh, and that head will take the full speed and feed right up to the capacity of the machine."

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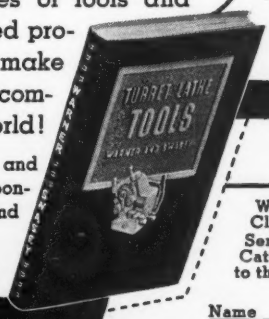

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time values of a series of time studies made on similar parts that have been processed in the same manner may be utilized in the construction of time study formulas and tables of standard time study data.

The methods of constructing "Time Study Formulas" and "Standard Time Study Data" and their application to the establishing of "set-up" and "each piece" time allowances will be discussed in a later article.

New Literature

Oilgear Fluid Power Straightening Presses of the gooseneck type, ranging in capacities from 25 to 200 tons, are described and illustrated in a four-page folder published by The Oilgear Company, 1323 W. Bruce St., Milwaukee, Wis. These presses are said to be modern in design, pleasing in appearance, sturdy in construction, easy to operate, and feature Oilgear sensitive control of variable ram motion. Typical parts which can be straightened on Oilgear Gooseneck Presses include front axle I-beams for light and heavy trucks, rear axle housings for heavy trucks, and connecting rods for locomotives. Copy of Bulletin 32200 free upon request.

"Convertible Slip Ring Motors." Bulletin M-2, "P&H Convertible Slip Ring Motors", is the most recent addition to the group of Harnischfeger electric motor catalogs. Giving a thorough analysis of the requirements demanded of the standard wound rotor type of slip ring motor, the booklet includes specific information describing how P&H motors are designed and manufactured.

Bulletin M-2 also describes the standard conversions for four types of service possible with P&H Convertible Slip Ring Motors; namely, Splash-Proof, Dust and Weather-Proof, Enclosed Fan-Cooled and Standard types. The cross-sectional line drawings and complete descriptions of the salient features of the stator, the rotor, the slip rings, brush holders and the P&H solenoid-operated brakes contained in the bulletin will be of interest to motor users in industrial shops, machine shops, steel mills, and all other branches of industry where motors with controlled starting and speed regulation are required.

Copies may be obtained by writing the Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wisconsin.

Flexible Shafts and Machines. In the 72-page catalog, N. A. Strand & Co., 500 N. Wolcott Ave., Chicago, Ill., presents the various types of Strand flexible shaft machines suitable for a wide range of operations, including grinding, polishing, buffing, scratch brushing, rotary filing, sanding, drilling, reaming, nut setting, screw driving, and so on. Numerous models, attachments and accessories are illustrated and described, and installation photographs are employed to give the reader an idea of the many applications of these machines. Copy free upon request.

Atlas Lathe Catalog. Two new small Atlas backgeared screw-cutting lathes, swinging diameters up to 6 in., are the subject of Catalog 29 released recently by Atlas Press Company. All phases of the modern compact design of the machine are completely described, including Timken spindle bearings, wide speed range, precision-ground bed, and V-belt drive. Copies are available from Department 7, Atlas Press Company, 546 N. Pitcher St., Kalamazoo, Michigan.

Gorton Super-Speed Vertical Milling Machines. Three sizes of these precision machines, designed particularly for die, mold and fine tool room work, are illustrated and described in detail in Catalog 1400-A published by George Gorton Machine Co., 1101 13th St., Racine, Wis. Optional equipment, including jig boring and die duplication attachments, hand or power feed table, power spindle feed, automatic reversing dogs, and so on, is also presented.

Copy of Catalog 1400-A free upon request.

McGill Electrical Specialties. The complete line of Levolier Switches and McGill Switches, Portable Guards, Socket and Wall Guards, and Accessories, manufactured by the McGill Mfg. Co., 1500 E. Lafayette St., Valparaiso, Ind., are presented in Catalog No. 38 now being distributed by this firm. The booklet is well illustrated and specifications are given for the models shown.

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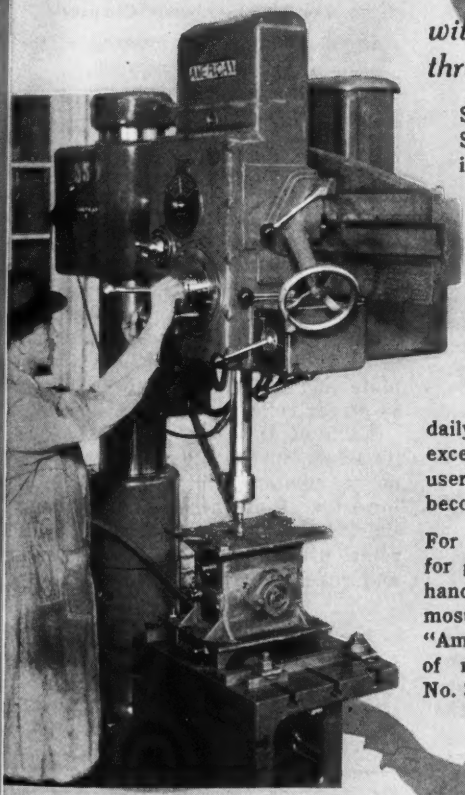

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CINCINNATI, OHIO, U. S. A.

Cost of Welding

Paper read by

E. W. P. SMITH

Consulting Engineer,
The Lincoln Electric Company

at the semi-annual meeting of the American Society of Mechanical Engineers, June 23, 1938

COST of a product—and that includes not only the expenditure of time, money and materials, but also must include the service or performance of the product—is most important, because it involves each and every process and aim of manufacture. These processes are (1) preparation, (2) welding, and (3) final or finishing treatment. Preparation of a study of type of joints, machining of the joints, shaping of the parts and sub-assembly; these are operations which must precede the welding.

Fig. 1—Outline of butt weld. Opening between plates depends upon plate thickness.

Welding involves labor, electrode and power. Labor cost is affected by the operating factor, which in turn is affected by positioning and the use of jigs and fixtures. Electrodes require a study of size and type or kind most suitable—size. Power involves not only the characteristics of the supply generator, a matter of efficiency of power conversion, but also the size of machine, which in turn is closely related to the required production. Following the welding is the final or finishing process which may be some simple item such as a name-plate and painting or more elaborate as stress relieving or heat treatment.

Each of the above operations has its effect on the cost, and they must be so combined as to result in the lowest cost of the product. A study, therefore, of these factors and their relationship results in some startling and revealing facts.

Type of Joint

The determination of the type of joint is dependent upon a number of

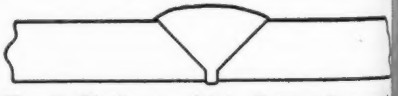

Fig. 2—Single vee joint. Preparation cost more and more electrode is used than for butt weld.

Items; (1) Load, (2) How the load is applied (steady, impact, endurance) and (3) Cost of preparation. The load

is a matter which concerns design, but the subject under discussion is cost; therefore it may be assumed that the type of joint has been determined from load basis or requirements.

As an example, assume a butt joint is required. There are several types of butt joints. The plain butt—

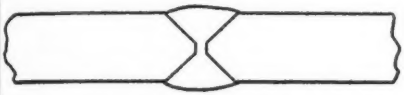

Fig. 3—Double vee joint. Cost of machining is higher than for single vee, but only half as much electrode is used.

preparation of which is simple—straight cuts to dimension, with opening between plates depending upon plate thickness. (See Fig. 1).

The single vee joint—preparation of this costs more than the plain butt joint and more electrode is required. (See Fig. 2).

The double vee joint—cost of machining is higher than for the single vee, but it requires only half the amount of electrode for the same plate thickness. The cost of machining and the cost of welding must both be studied and the joint selected on the basis of lowest cost. As an example, in a given plant the cost per pound of deposited metal is known and the cost of machining per foot is known. A combination of the two resulting in lowest cost is selected. This can be rather easily done when basic cost figures are known. (See Fig. 8).

Next in matter of preparation is machining of parts. A study of this in relation to welding will often indicate changes in either welding or machining, or both, and consequently a cost reduction. Take, for example, the type of scarf—single vee—double vee—single U—double U. There is also the matter of shaping or forming the parts. Does it cost less to bend a plate than to weld two plates? Shall a combination of welding and forming be used, or will plates cut to size and welded produce lowest cost? Can combinations of several shaped parts be used?

These shapes are not only bent and formed but may also be cut by gas or by machine to usual and unusual shapes. It is interesting to note that up to 5 in. thick plate (incl.) with oxygen at $1.00 and acetylene $2.00 per 100 cu. ft. the cost for gas per 100 square inches cut is about $ .25. The speed of cutting increases rapidly as thickness of plate is reduced so there is no easily remembered relation throughout this range of plate thickness. (See Fig. 4).

The data given above are based on fatigue and no set up. By careful use the cost of gas per foot is not materially changed by the operating

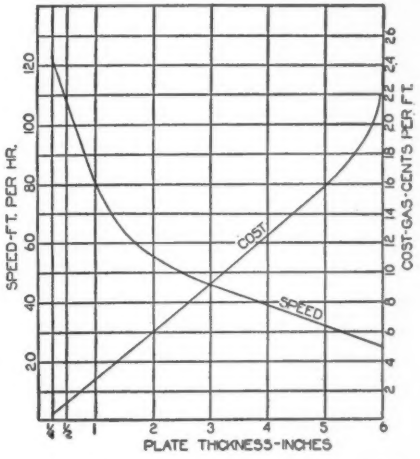

Fig. 4—Chart showing gas costs for machine cutting good mild steel.

factor, but labor cost is. The speed and labor, with or without overhead, may therefore be converted to cost per foot cut and a suitable curve plotted. Assume the operator is paid $1.00 per hour and the operation fac-

tor is 50 per cent, then cost per cut can be readily calculated by adding to gas cost per foot of cut, the labor cost per foot cut. The sum of the two is the cost per foot.

Next is the matter of sub-assemblies. Obviously only general statements can be made, but a study of assemblies and sub-assemblies, the case of handling, and accessibility of welds are all factors to be considered, and welding permits those sub-assemblies and assemblies to be so easily made.

The preparation of these for welding involves determination of type of joint, machining of joint, shaping and cutting of the parts and sub-assemblies, and their effect on welding cost.

Welding cost is made up of three general parts; (1) Labor, (2) Electrode, and (3) Power. Labor costs depend largely on the operating factor and the speed of welding.

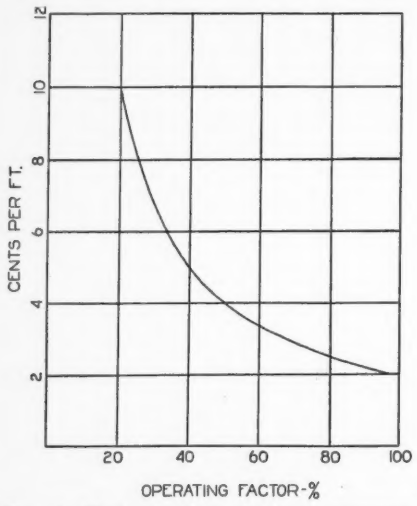

Fig. 5—Chart showing effect of operating factor on cost per foot of weld.

Assume a labor rate of $1.00 per hour, and an arc speed of 50 feet per hour. (Arc speed is the rate of travel of the arc and may be expressed in inches per minute or feet per hour.) Then for different operating factors

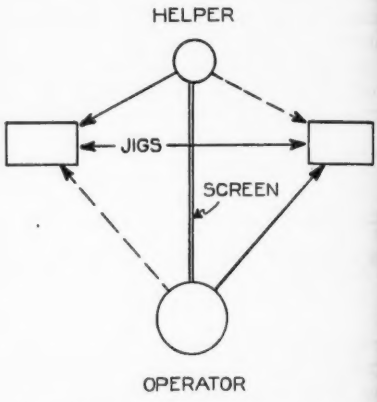

Fig. 6—Layout showing relative positions of operator, helper, and work to obtain maximum production.

the operating factor is percent of total time the arc is in operation:

Operating Factor	Production per hour (Ft. per hr.)	Cost per Foot
20%	10	$ .10
40%	20	.05
60%	30	.0333
80%	40	.025
100%	50	.02

(See Fig. 5).

It is obvious from inspection of this curve that the greatest cost reduction can be made by increasing the operating factor; that is, keeping the operating factor in the higher brackets. One method of doing this is by use of proper jigs and fixtures and proper set-up. Suppose it takes an operator two minutes actually to weld a job and two minutes or slightly less to set it up. Four minutes per part or fifteen per hour.

If, however, a helper and another jig are provided, then the helper can set up while the operator is welding,

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and production is 30 parts per hour at a lower cost per part.

15 per hour takes	30 per hour takes
1 Jig	2 Jigs
1 Welder	1 Welder
1 Operator	1 Helper
	1 Operator

(See Fig. 6). The cost reduction is obvious since the second fifteen are obtained at a cost of 1 jig and 1 helper.

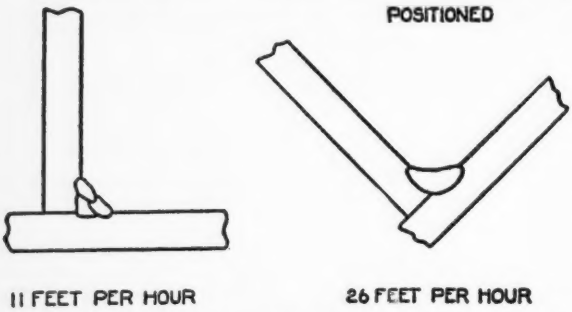

Fig. 7—Comparison of production obtained when welder is forced to weld upward part of the time, and when all welding is downward.

Another factor in reducing labor costs is the matter of positioning the work so that it will be convenient and easy for the operator to weld. This aid to convenience will be very helpful in cost reduction. In addition, the matter of so placing the part that the operator can always weld downward will result in a considerable increase in the speed of welding and less fatigue of operator. For example, a ½-in. fillet weld would be at 11 ft. per hour arc speed. If it were positioned, the arc speed would be 2[illegible] ft. per hour. The cost reduction is apparent. (See Fig. 7).

For reduction of costs due to labor, a high operating factor is necessary, which can be obtained by the proper use of jigs and fixtures. Speed may be increased by proper positioning so as to make it easy for the operator to work. These labor factors of cost may be applied to a great many fabrication processes but are particularly controllable when applied to welded fabrication.

The cost due to the electrode is an important factor, and — note the statement—not the cost per pound of the electrode, but the cost due to use of electrode. The size, the quality of deposit, and the physical characteristics of the joint are all items dependent upon the electrode.

The matter of size of the electrode used is a considerable factor of cost of deposited metal and joint. As a basis of discussion, assume that only the size is changed. The deposition efficiency (ratio of deposited metal to total electrode purchased), kind of

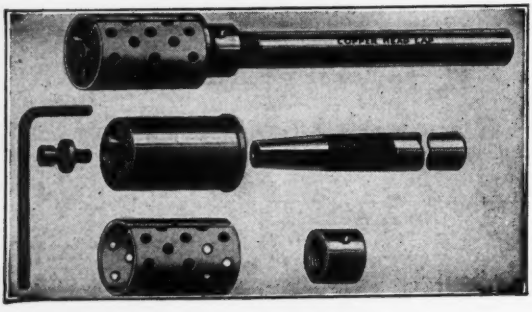

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TABLE A

Effect of Electrode Size on Cost of Deposited Metal

Electrode Size	1/8	5/32	3/16	1/4	5/16	3/8
Amperes	110	130	150	250	325	425
Arc Volts	24	25	26	30	34	38
K. W. at Arc	2.64	3.25	3.9	7.5	11.1	16.1
Consumption Rate Lbs. per hour	2.6	3.3	3.95	7.5	10.7	16.2
Deposit, Lbs. per hour (50% operating factor)	.87	1.1	1.32	2.5	3.57	5.4
Eff. of Set (%)	47	50	51	55	59	59
K. W. Input	5.6	6.5	7.65	13.65	18.8	27.3
Interruptions per lb. consumed	18	12	8	5	3	2
Cost Per Pound Deposited						
Labor	$1.150	.909	.758	.400	.280	.185
Overhead	1.150	.909	.758	.400	.280	.185
Power	.064	.059	.058	.055	.053	.051
Electrode	.150	.135	.127	.127	.127	.127
Cost of Interruption	.050	.033	.022	.014	.008	.005
	$2.564	2.045	1.723	.996	.748	.553

(See Fig. 8)

joint, and all other items except electrode size are fixed.

As an example, calculate the cost per pound of deposited metal on the following basis:

Labor at $1.00 per hour
Power at .02 per K.W.H.
Electrode as indicated
Operating Factor 50%
Overhead 100%
Deposition Eff. 66 2/3%

Note that the use of ¼-in. electrode in place of 3/16-in. means a cost reduction of 42 per cent, $\frac{.995}{1.717} = 58$ per cent, and a study of the curve in Fig. 8 shows the economy and cost reduction to be obtained by use of proper size electrode. That is, to obtain the lowest cost, the largest size electrode which can be used is the most efficient.

Further reasons for the use of a large electrode is that tendency to distortion is less with fewer number of passes, and large electrodes permit fewer passes. Ductility is higher with fewer number of passes. A reduction in cost and an improvement in quality results from the use of large electrodes.

Another ite to consider in r lation to costs welding is th performance o the electrode. Th cost per foot per pound of d posited metal not the cost p pound of ele trode purchas —is the importa item of cost in far as electrode concerned. Pe haps it might said that depos tion efficiency a speed are the determining factors, b cause it is true that the physical pe formances for the electrodes to compared must be the same or near so.

An elementary illustration of th in reference to speed only will illuminating—

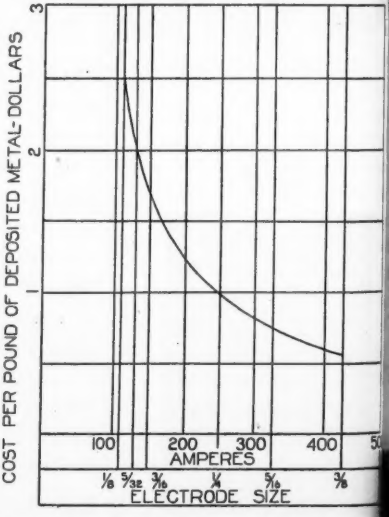

Fig. 8—Chart illustrating effect of size electrode on cost per pound of deposi metal

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• Buckeye's 787 standard sizes of finished ready-to-use bushings are the time-proven answer to most industrial requirements. For others, the entire facilities of this 38-year old organization are at your service. • "Special bearings to customer requirements" are available in phosphor and gun metal analysis, 3 grades of high lead bronze, and any special analysis that may be needed—slotted or split, in an infinite variety of I. D., O. D., and lengths with or without flanges, lugs, oil grooves, oil holes, etc., exactly to meet the requirements of your particular conditions. Let us show you how Buckeye's wide experience and extensive pattern and machine facilities can save you time and money. Inquiries answered promptly. Let us quote on your requirements.

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Catalog "O" lists 268 sizes of Electric Motor Bearings.
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Four years ago a line of end mills was introduced by a new manufacturer in the cutting tool field. Today those end mills are the first choice of thousands of production men in every section of the country.

Practical design . . . the finest quality high-speed steel . . . expert and precise workmanship . . . heat-treating by the ultra-modern salt bath process . . . an unconditional performance guarantee . . . have all contributed to this sensational acceptance of Putnam Hi-Speed End Mills. The most convincing argument in their favor, however, has been in results, experienced in the first trial and succeeding production tests, that have prompted manufacturers to continue to use Putnam End Mills exclusively. Those same results will sell you—and KEEP you sold—on the end mills—that "CUT FASTER and LAST LONGER."

Write for Complete Catalog.

PUTNAM TOOL COMPANY

2981 Charlevoix Ave. • Detroit, Mich.

100 Feet of Welding

Arc Speed (Ft. per hr.).....	20	25	30	4
Arc Time	5	4	3.3	2
Set up time hrs.....	2	2	2	2
Total Time.....	7	6	5.3	4

If each hour cost $2.00 then th following results are obtained:

Time—(hrs.)	7	6	5.3	4.5
Arc Speed (Ft./Hr.)....	20	25	30	40
Cost .....$	14.00	12.00	10.60	9.0
Cost Reduction		2.00	3.40	5.0
Increase in Production..		17%	32%	55%

Based on 7 hours as standard.

Note that set up time is no

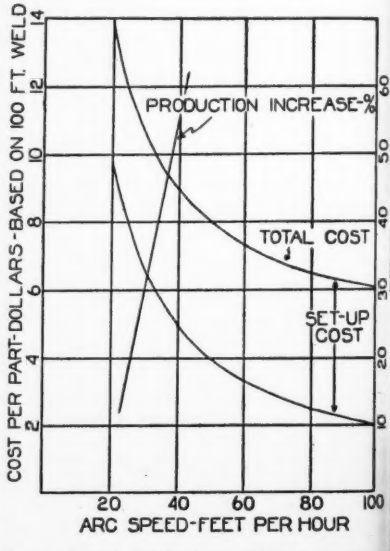

Fig. 9—Chart illustrating relation of produ tion increase to increase in arc speed

changed, but because of arc speed in crease there is a marked increase i production with no increase in equip ment or floor space.

(The second half of this paper will be publish in the August number of this magazine).

Save 50% to 95% on your Bending Costs with "Buffalo" BENDING ROLLS

● That's a lot to save on one group of operations in your plant, but it is being done by many industrial plants where Buffalo Bending Rolls have replaced old and obsolete methods of bending. These rugged, powerful machines make easy work of circle, segment, and spiral bending. Handle all shapes—angles, tees, beams, channels, flats, tubes, squares, rounds, etc. Sizes to fit your needs.

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Modern Equipment at Work

Boring and Facing A Stellite Valve Seat With Tungsten Carbide Tools

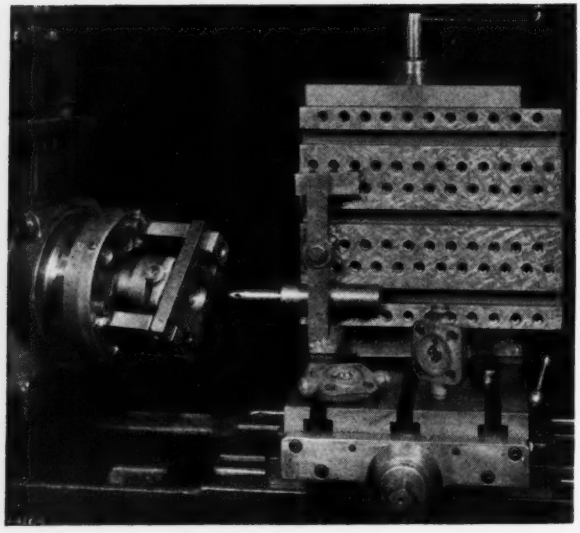
Machine boring and facing to close tolerances rather than finishing by conventional grinding of Stellite-faced parts has been worked out successfully in a number of recent installations, using tungsten carbide tools.

The accompanying illustration shows such a set up for taper boring and facing of a Stellite valve seat welded into an alloy cast iron valve body. An Ex-Cell-O general purpose precision boring machine fitted with hydraulic fixture feed cylinder was used.

For this operation, a surface cutting speed of 40 ft. per minute worked out well with the tungsten carbide tools, feed being 0.003 in. per revolution. The spindle of the boring machine was set at a 22-deg. angle in order to handle the taper condition. Automatic fixture cross-feed for the facing portion of the operation was obtained through a standard hydraulic cylinder arrangement. The machine, it will be noted, is equipped with an Ex-Cell-O Universal fixture designed to facilitate handling of a variety of small-lot production runs on the same machine.

An idea of the good finish obtained by machining in this set-up is provided in the valve specification, which called for holding 600 lbs. pressure at 850 deg. Fahrenheit.

This method of hard-facing valve seats with Stellite and using tungsten carbide tools to machine the seats has been adopted by a number of leading valve manufacturers.



Set-up for boring and facing a Stellite Valve Seat in an Ex-Cell-O General Purpose Precision Boring Machine using Tungsten Carbide Tools

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The Ryerson Certified Steel Plan assures uniform high quality steels—at no extra cost. You have definite assurance of getting steel which has the features most desirable in the particular kind you order — whether it is a deep drawing quality sheet, high tensile structurals, easy machining screw stock or high finish stainless.

On alloy steels you get still another added feature. Ryerson sends accurate data on every bar delivered so that your heat treater can easily secure desired results—a service never before attempted by any steel-service company.

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Ideas from Readers

This department is a clearing house for ideas from readers . . .
Every "kink" or short cut published will be paid for.

Salvaging Obsolete Work

By K. N. Banthin

IN order to salvage some 150 partly machined hydraulic cylinders that had been rendered obsolete by changes in design it became necessary to drill

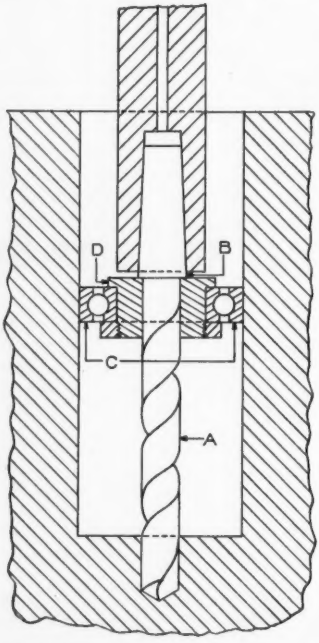

Illustration showing use of ball bearing to center drill in long hole

a ¾-in. hole at the exact center in the bottom of each of the bored castings. The bores were 3.515 in. diameter. To ensure the drilling of the hole in the exact center, the tool illustrated was devised.

A standard ¾-in. high speed steel drill, indicated at A, was chucked in the lathe and, using a toolpost grinder, the end of the taper shank adjoining the flutes was ground back and down to the diameter of the drill. Then the bushing D was made, the hole being a press fit on the drill and the outside being turned to a press fit for the inner race of an SKF light series No. 6210 ball bearing, indicated at C. The outside was also threaded for a short distance for a collar so that the ball bearing could be locked in place. The ball bearing was now ground down from 3.5433 in. to 3.516 in. diameter, which was a running fit in the bore of the work-piece.

With this arrangement the drill was properly centered, and the 150 castings were efficiently and economically drilled in a standard drill press by the usual drill press operator. A marked degree of accuracy was obtained with a minimum cost for the special tool.

Speeding Up Sight Glass Installation

By M. T. Pate

WHEN the Oilfields Machine Company secured the contract from the Blank Pipeline Company to install sight glasses on the six sets of suction surge bottles on its triplex pumps, one of the stipulations was that no pump might be shut down for to exceed thirty minutes — which meant that each of the 18 cast iron air chambers, 10 in. in diameter and a good 1 in. in thickness, must be

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in the aircraft industry, they check the planes, engines, parts and accessories with

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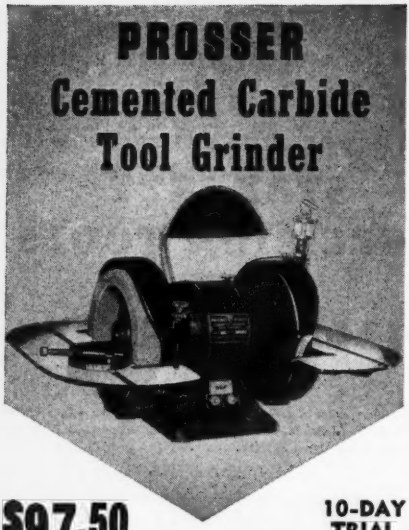

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When equipped with proper wheels, this grinder is unexcelled for the proper grinding of high speed steel, Stellite, and all other types of cutting tools.

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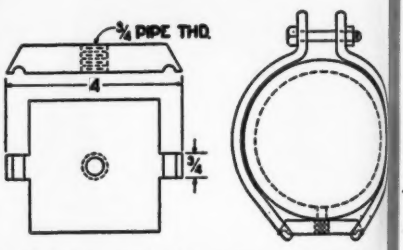
drilled twice and those holes tappe for ¾-in. pipe and the necessar angle cocks fitted within the shor time limit. Another limitation re quired that the work be done on th chambers in place on the pump ruling out the plan of fitting up temporary surge bottle of welded con struction to be used progressively a replacement while each cast unit wa taken down and worked over unde most advantageous conditions.

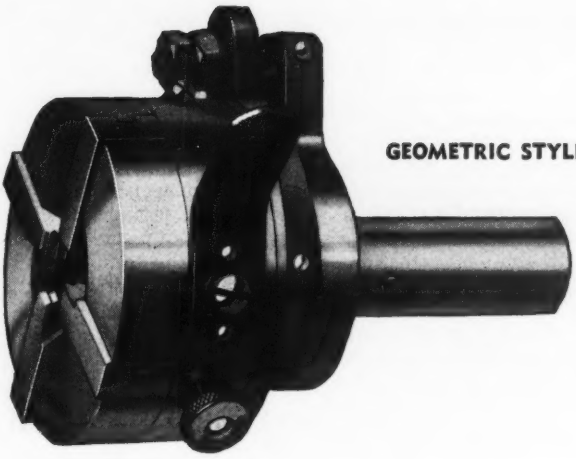
The drilling of the 15/16-in. hole



(Left)—Top and side view of threading-starting plate used to insure exact setting gauge glass fittings in pump air chamber (Right)—Plan view showing threading—starting plate clamped in place around air chamber with single bolt and two lengths of transmission chain

in the air chamber castings was no particularly difficult, being merely question of location and maintenanc of correct drill perpendicularity. Bu when it came to running the usua type of four-fluted pipe tap in thi hole, with the surface curving awa from the cutting edges on two side and meeting it earlier on the other quick and accurate tapping was different problem.

To insure the exact tapping of a holes and to prevent any possibilit of damaging an air chamber throug tap damage, steps were taken in ad vance to guard against known diffi culties. Out of a piece of flat boile plate, ¾ in. in thickness, a 4-inc square with two ¾ in. ears was cu with a torch, shallow grooves be ing scored across the upper face



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Difficult thread-cutting jobs are easier and cheaper when Self-Opening Die Heads are used. The elimination of backing-off brings higher production and more accurate threads. Replaceable Chasers and the ability of each tool to cut a wide range of diameters—means greater economy. Size adjustments for wear and grinding insures that the last thread will be as accurate as the first.

For general Light Duty threading—fine pitches on the smaller diameters, short lengths—Geometric offers the Style DS Self-Opening Die Head. Designed especially for B. & S. Automatics, suitable for hand machines as well; with sensitive trip to prevent stripping or shaving, automatic closing attachment, floating shank and buffer action—a tool that produces smooth, accurate threads to close limits, for less money.

Few products are without threaded parts somewhere and fewer still are the shops where this threading cannot be done cheaper and better by Geometric Tools. Let us send you our folder describing the Style DS Head.

The Geometric Tool Company

NEW HAVEN, CONNECTICUT

the two ears, as shown in top and front views of the plate at the left in the illustration. Through the center of this plate was drilled and tapped a ¾-in. pipe thread, centered and held to the perpendicular during tapping.

This thread-starting plate was then spotted directly over the hole drilled through the wall of the air chamber casting, and held rigidly there by a clamp composed of two short sections of transmission chain, hooked over the grooves in the plate ears, and carried around the chamber to be tightened on the opposite side with a half-inch bolt passed through two links and drawn tight.

This starting plate could be tapped lightly on either one or the other side near the chain and quickly set properly tangent to the cylindrical casting. Thus spotted, the tap could be quickly screwed into the threads of the spotting plate, entering the hole in the casting evenly and without jerking, and producing a smooth, full thre with none of the troublesome "dod ing" familiar to every mechanic wh has attempted to thread a hole in relatively small cylinder.

When the entire battery of bottles had been fitted with the gaug glasses, inspection showed that t and bottom fittings liked as precise as soldiers on parade, despite the 4-i offset in the gauge cock casting Also all of the joints in the cast iro chambers were tight from the star largely due to the quicker and bett work possible with the starting plat

Handles for the Machine Vise

By C. F. Fitz

ONE of the toilsome jobs co nected with shaper or plan work is the task of putting the vi on the machine table or removing

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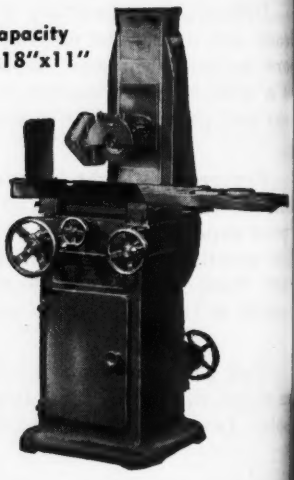

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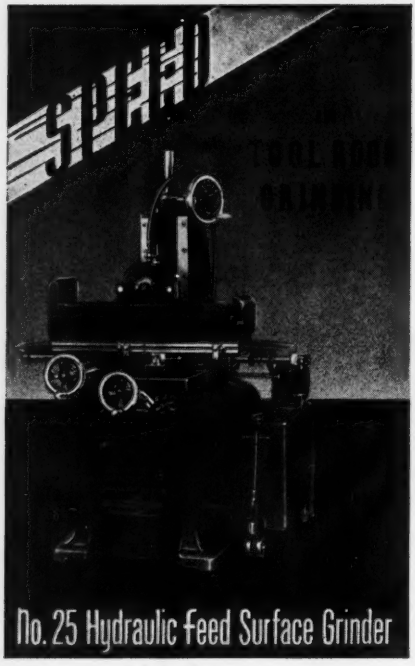

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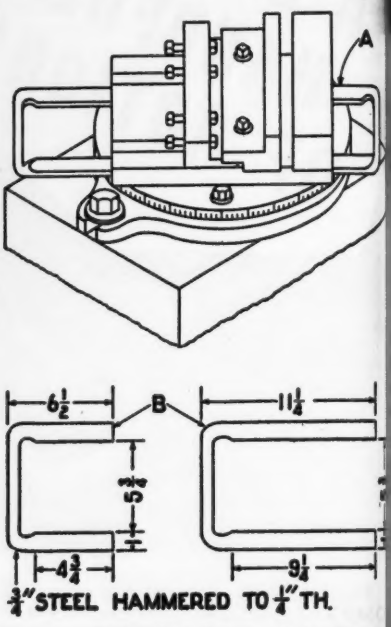
Write for catalog on this speedy grinder today.

Gallmeyer & Livingston Co.
308 STRAIGHT AVE., S. W.
GRAND RAPIDS, MICH.

when there is no hoist available. T simplify this task and at the sam time to prevent injury to the vise, th machine, and the operator, the vi handles shown at A in the drawin were made.

The handles are made from ¾-i round cold rolled steel, forged to th



Drawing illustrating design of handles f use in lifting machine vise

shape and dimensions shown at I To use, the handles are inserted int the tee slots in the vise. They ar simple to slip into place, simply re moved, and require no clamping.

Simple Method of Straight ening Thin Tanks

By W. F. SCHAPHORST

THE drawing illustrates a simpl method of straightening dents i sheet metal tanks. If a straightenin

SIMONDS

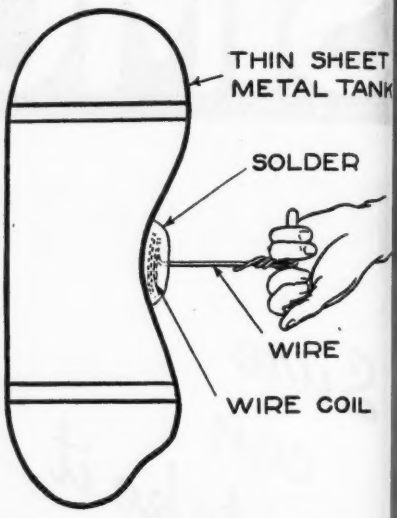
RED END HACK SAWS

SOLD BY SELECTED SUPPLY DEALERS

Sure can take it

rod can be used inside the tank, or if it is practical to apply internal pressure by means of water or by other means, this method may take more time and is not recommended, but sometimes the neck of the tank is small or the interior of the tank is inaccessible, in which case there is no other method as practical or economical.

Proceed as follows: Make a coil on the end of a wire, and solder the coil onto the tank at the center of the dent. When the solder is cold, pull the wire with one hand and simultaneously pound around the outside of the



Drawing illustrating method of straightening dents in thin metal tanks

dent with a hammer held in the other hand. The dent will usually be straightened without difficulty.

After the straightening has been completed, the solder is easily melted off.

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AMAZING POWER

THRILLING SPEEDS

Steel construction throughout. Positive quick acting air control valve. The ONLY hand grinder with spindle speed of 100,000 R. P. M. on 100 pounds air pressure. Operates on air pressures of 40-100 pounds. Weighs 14 ounces.

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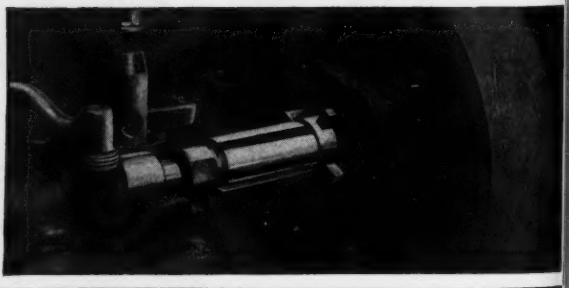

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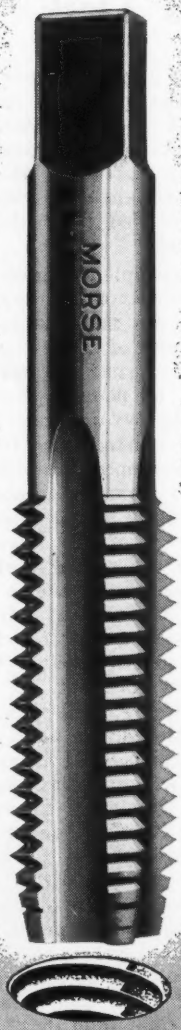

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TWIST DRILL AND MACHINE COMPANY

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NEW YORK STORE: 130 LAFAYETTE STREET - - - CHICAGO STORE: 570 WEST RANDOLPH STREET

Over the Editor's Desk

Advertising Pays—Everybody

OUR "birthday" editorial in the June issue brought forth some interesting letters, mostly of congratulation. One writer, however, took this opportunity to raise the question "Isn't the cost of advertising added to the selling price of a product, and wouldn't the buyer of the product get it much cheaper if he didn't have to pay for the advertising?"

Yes, the buyer pays for the advertising, just as he pays for all merchandising involved in getting to him the things that he needs. The man who buys a shirt from his local haberdasher pays not only for the cloth and the cost of making the shirt; he pays a share of the expense involved in sending a salesman to show this shirt and other shirts to the haberdashers throughout the country; he pays a share of the operating expenses of the store, and he pays a share of the salary of the clerk who sold him the shirt, in addition to his share of the cost of the advertisement that told him that the shirt was there.

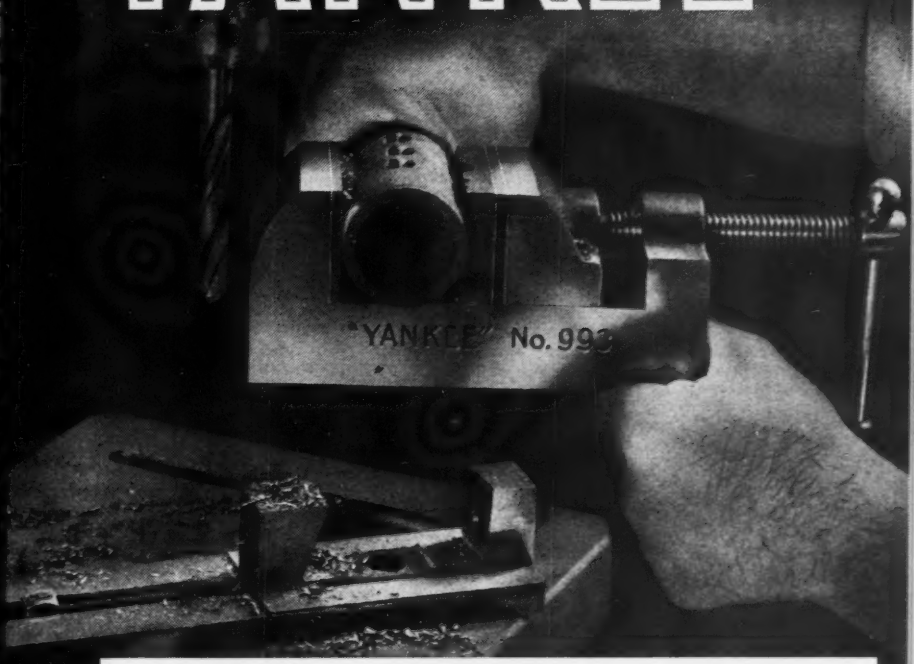
Yet that advertisement has made it possible for the buyer to obtain the shirt at a cost much lower than would be possible if there were no advertising. Why? Because the advertisement attracts buyers immediately and multiplies sales to a point where a substantial reduction in the price is possible. Instead of perhaps five customers who happened to pass that way, the merchant has perhaps 100 customers, each bent on having one of those shirts. Instead of a profit of $1 each on five customers, the merchant can make a profit of 50 cents each on 100 customers and, while making a great deal more money, c reduce the price 50 cents on ea shirt. If his advertisement in t local paper cost him $10, he has st made $40 instead of $5 on his da shirt sales and the customers ha still purchased their shirts at a r duced price.

The principle outlined here appli to all lines of merchandising—a this includes machine tools. An a nouncement of a new machine in technical journal may result in a sco of sales to people who might ha been entirely unaware that such machine existed had they not se the announcement and, like shirt sal increased volume makes possible reduced price to the consumer. Ev if the cost of the advertisement added to the selling cost of the pr duct, when spread over a large volu of sales the cost of advertising, p sale, is only a fraction of the cost r duction made possible through th same advertisement.

Advertising, well planned and jud ciously placed, can hardly be regarde as an expense. It is an investmen and one which in many cases pays in portant dividends to everyone co cerned. It is not unusual for a 10 dollar investment in an advertis ment to produce sales running int many thousands of dollars, which n only means added profit for the sell and reduced prices to the buyer, w also result in employment for hu dreds of men, and what investme could be finer than that?

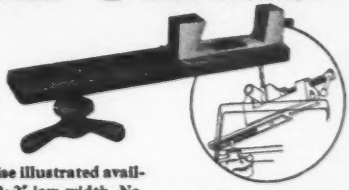
We hope that we have answered o enquirer to his satisfaction; a know edge of merchandising is as valuab to the manufacturing executive as knowledge of manufacturing is the merchandising executive.

"YANKEE"



VISE and VISE CLAMP

"YANKEE" Vises and Vise Clamps are made to work together—for more accurate results in less time. "YANKEE" Vises are a real convenience in any shop. Work can be kept in alignment for a series of jobs. The clamp holds Vise rigidly for machining operations. Its long slotted body makes for quick and easy adjustment of work on Drill Press table. Vise illustrated available in four sizes: No. 991; 1½" jaw width. No. 992; 2" jaw width. No. 993; 2¾" jaw width. No. 994; 4" jaw width.



"Yankee" Vise Clamp easily attaches "Yankee" Vise to face plate. Assures rigidity and accuracy, in holding work for drilling and machining operations

"Yankee" Vise Clamp made in two sizes only: Clamp No. 2992, length 9¾", for Vise No. 992. Clamp No. 2993, length 10½", for Vise No. 993.

Order From Your Supply House. For "Yankee" Vise Circular, Write North Bros. Mfg. Co., Dept. MS, Philadelphia, U. S. A.

New Shop Equipment

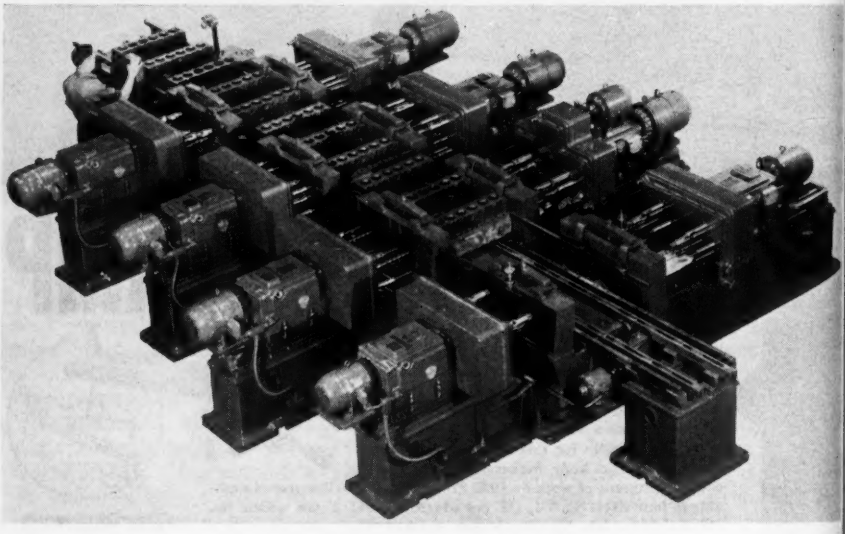
Natco "Holeway" Multi-Driller and Tapper

A total of 47 drilling, chamfering, counterboring, reaming and tapping operations are performed on the two ends of a motor block by the Natco "Holeway" Multi-Driller and Tapper illustrated herewith. The machine, a product of The National Automatic Tool Company, Richmond, Ind., is built of eight Natco Holeunits, one Natco auxiliary reversing motor drive tapping unit and a straight-line mechanical indexing type fixture which is arranged to hold two cylinder blocks in each position. Each Holeunit is equipped with a fixed center gear-driven spindle box, the eight boxes containing a total of 84 anti-friction bearing mounted spindles complete with nose adjustment and four tapping spindles complete with individual lead screws and tap holders. The tapping spindles are driven by an auxiliary Natco reversing motor drive tapping unit mounted on the second right hand Holeunit.

One operator loads the machine and completely controls its operation through the use of a single push-button station which is conveniently located. The cylinder blocks come to the machine on a roller type conveyor, being positioned by the operator in the loading station. Once positioned, the blocks are then automatically indexed from one station to another and are automatically loaded in the sixth, or unloading, station.

The entire machine is electrically interlocked and, under normal operation, will perform the operations listed at a rate of 90 blocks per hour. The cycle of operation is as follows: Position No. 1, load two cylinder blocks; Position No. 2 (left hand head, front end of block), drill oil gallery hole to required depth, drill eight holes, (right hand head, rear end of block) drill oil gallery hole to required depth; Position No. 3 (left hand head, front end of block), drill oil gallery hole to additional required depth, drill four holes, chamfer three holes, (right hand head, rear end of block), drill six holes.

Position No. 4 (left hand head, front



Natco "Holeway" Multi-Driller and Tapper

end of block), drill oil gallery hole to additional required depth, rough core drill one Welch plug hole, spot drill one hole, drill one hole, tap two holes, (right hand head, rear end of block), drill oil gallery hole to additional required depth, drill three holes; Position No. 5 (left hand head, front end of block), drill oil gallery hole to additional required depth, finish core drill and counterbore one hole, drill five holes, (right hand head, rear end of block), combination ream and counterbore end of oil gallery hole, finish core drill and counterbore one hole.

The weight of the Natco "Holeway" Multi-Driller and Tapper is 60,500 pounds.

Ex-Cell-O Series 31 Precision Thread Grinders

Designed to still further increase flexibility, productivity and accuracy in precision grinding of threads in regular production, Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich., has incorporated a large number of improvements and refinements in its Series 31 Precision Thread Grinders. Among the new features are such items as a recently developed built-in taper grinding attachment, an increase in the number of grinding wheel speeds, provision for using grinding wheels from 12 to 18 in. diameter, an electrical system for increased flexibility of operation, improved coolant system for closer temperature control, and so on.

The wheel slide on the Series 31 has been designed for mounting of a built-in taper attachment. A bracket with a set of rollers is fastened to the table with the rollers contacting interchangeable cam plates for various taper angles. The device causes the entire grinding wheel head assembly to move forward and backward on its slide at right angles to the work axis. It will also handle combination taper and straight work or special shapes.

The grinders are designed to grind in both directions, eliminating lost time during return traverse, and are provided with manually-operated diamond dressers to eliminate time lost and grinding wheel wastage with automatic dressing.

Of particular interest in the Series 31 is the provision for maintaining desired surface speed with different sizes of grinding wheels or as the wheels wear down. By means of two-step interchangeable pulleys for both wheel and motor spindles, furnished with the machines, a given surface grinding speed can be obtained for any wheel size from 12 to 18 in., in increments of one inch. Seven thousand surface feet per minute is recommended for 29 deg. and Acme threads and 9,000 surface feet per minute for 60 deg., U.S. and sharp V-threads.

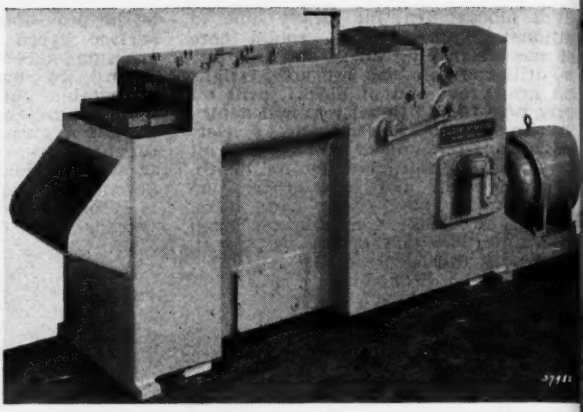
Ex-Cell-O Series 31 Precision Thread Grinder

The heavier work head, now equipped with two Ex-Cell-O precision bearings, is driven from a two-speed motor through worm gearing. Four-step pulleys on both the motor and the work spindle now provide a range of eight work spindle speeds, ranging from 6 to 60 r.p.m.

The coolant tank has been increased in capacity to 50 gal. and is now located at the rear of the base, and the ¼ h.p. coolant pump is also externally located at the top of the tank. Increased flexibility of operation is provided by having the controls located on the front of the machine.

Other machine features include: heavily ribbed base with ⅝-in. minimum wall thickness to insure rigidity; hardened and ground alloy steel precision wheel spindle; hand lever for quickly disengaging wheel from the work at the end of the cut; hardened and precision ground lead screws with split bronze

nuts to permit taking up for wear, with the lead screw reversible in its mounting to further distribute wear evenly over the entire screw; positioning device on work head for quick locating of previously roughed threads in relation to the grinding wheel; horizontally adjustable hardened and ground V-shaped steel ways for the table, which rides on hardened, ground and lapped steel rollers, and a work spindle nose provided with tapped holes for attachment of indexing fixtures.

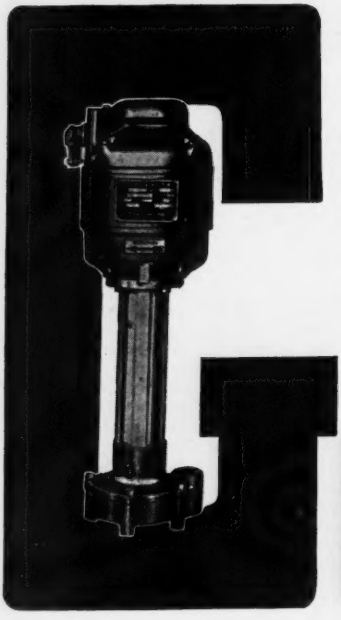


Colonial Special High Speed Horizontal Hydraulic Broaching Machine

Colonial Special High Speed Horizontal Hydraulic Broaching Machine

Broaching two flat surfaces on each one of more than 3,000 steel hydraulic brake couplings per hour is the unusu job performed by the Colonial Speci High Speed Horizontal Hydraulic Broach ing Machine shown here.

The machine is almost completely en closed, contributing to safety, and



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GUSHER

THIS VERSATILE "HY-POWER" PRESS SAVES

ON PRESSING, FORMING, CRIMPING, STAMPING, AND DRAWING OPERATIONS

Hannifin "Hy-Power" hydraulic operation of this 12½-ton utility press combines fast, semi-automatic operation, easy handling, and ready adaptability to many different types of work. Available in capacities from 12½ to 60 tons.

HIGH SPEED: The complete operating cycle is approximately 2 seconds. High production rates are steadily maintained.

"HY-POWER" CYCLE: The exclusive "Hy-Power" hydraulic operation provides an automatically completed press cycle when the push button control is pressed. This cycle includes: 1. Rapid advance until the die touches the work, 2. Automatic high pressure working stroke, 3. Automatic reversal at maximum pressure, 4. Rapid return to starting position. The oil pump idles at zero pressure between cycles.

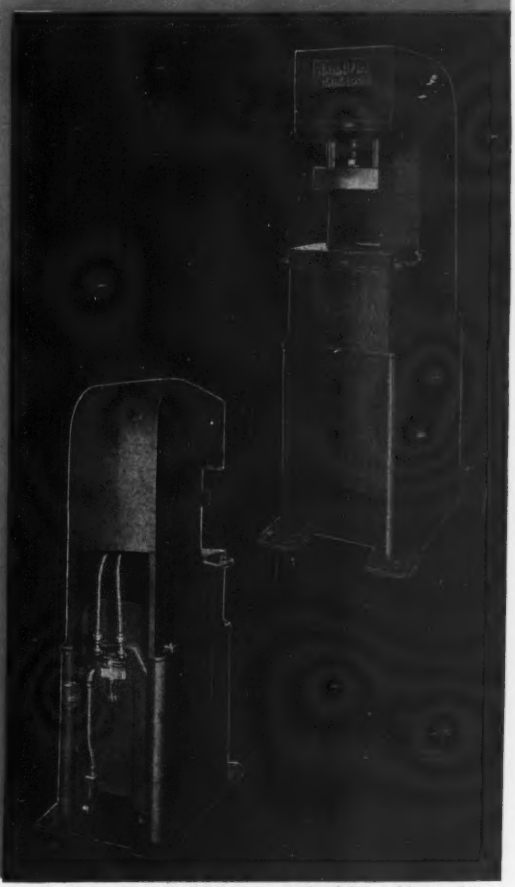
SELF-CONTAINED UNIT: The "Hy-Power" hydraulic pressure generator, driven by 2 h.p. motor, is built into the base of the press. Floor space 22½x34½ in. Only electrical connections needed for installation.

SAFETY CONTROL: Two push buttons at the sides of the table must both be held down to operate the press, insuring that the operator's hands are clear. Releasing either push button stops the ram and returns it to top position. The press will not repeat if the push button is held down, but completes one cycle and stops.

LONGER DIE LIFE: The "Hy-Power" hydraulic cycle removes the necessity for close vertical die adjustment. The smooth hydraulic action extends die life. Working pressure and reversal may be adjusted.

ADAPTABLE: This high speed general utility press handles many types of work with equal facility. It is being used for pressing, crimping, forming, stamping, and shallow drawing operations, and is readily adapted to any similar work involving pressures within its rated capacity.

Write for Bulletin 41-MM describing many other Hannifin Hydraulic Presses.



Specifications: Capacity 12½ tons, stroke 3 in., table to platen (up) 9 in., center of ram to face of frame 7 in. Platen (guided) 6x10 in. Table 10x15 in. Base 22½x34½ in. "Hy-Power" hydraulic pressure generator driven by 2 h.p. motor.

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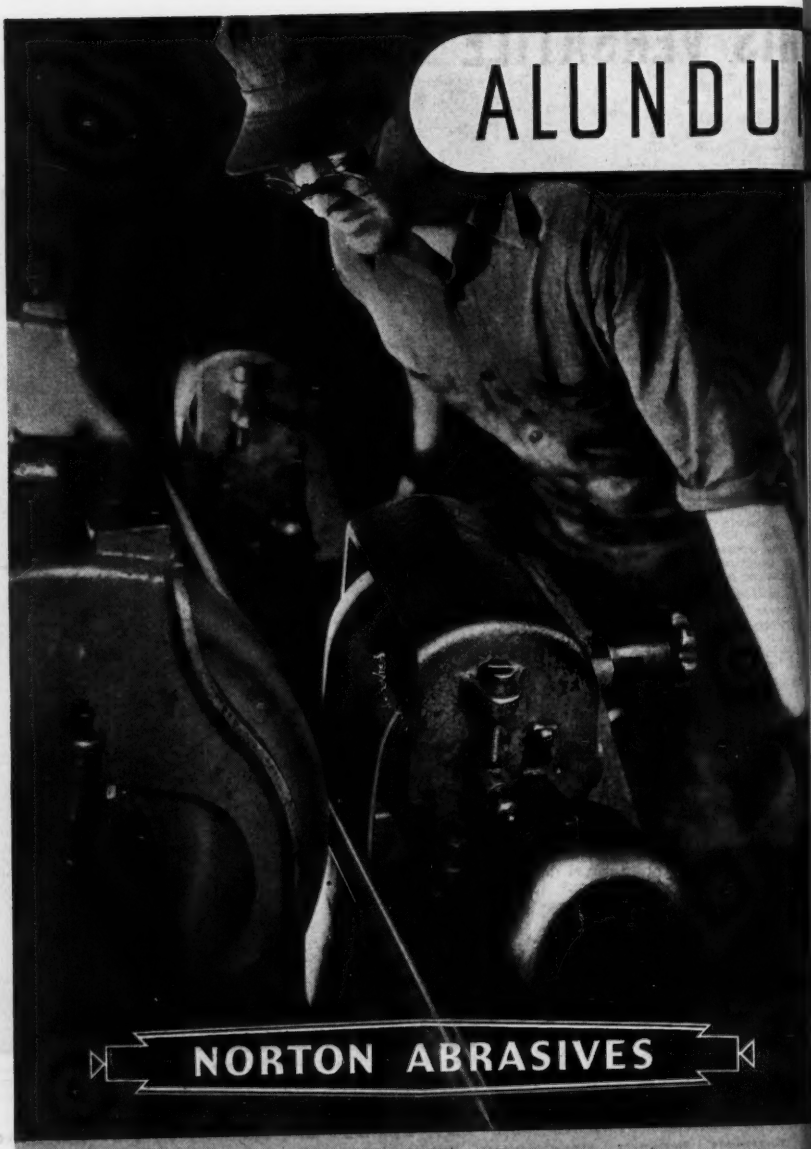
HANNIFIN

"HY-POWER" HYDRAULIC PRESSES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And that's why Alundum Abrasive is so popular for centerless polishing. Its uniformity—not only in grain size but also in grain shape and capillarity—gives the uniformity in wheel heads that is so essential—uniformity in finish, in cutting action and in wheel life. Adjustment time when wheels are changed is reduced to the very minimum.

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G-65

completely automatic in operation. The operator merely starts the machine and drops the parts into two loading apertures in the top of the machine. The finished parts are ejected into the basket at the left. The broaches are stationary, the work being pushed through the broaches. There are two sets of broaches, permitting simultaneous broaching of two pieces on each stroke.

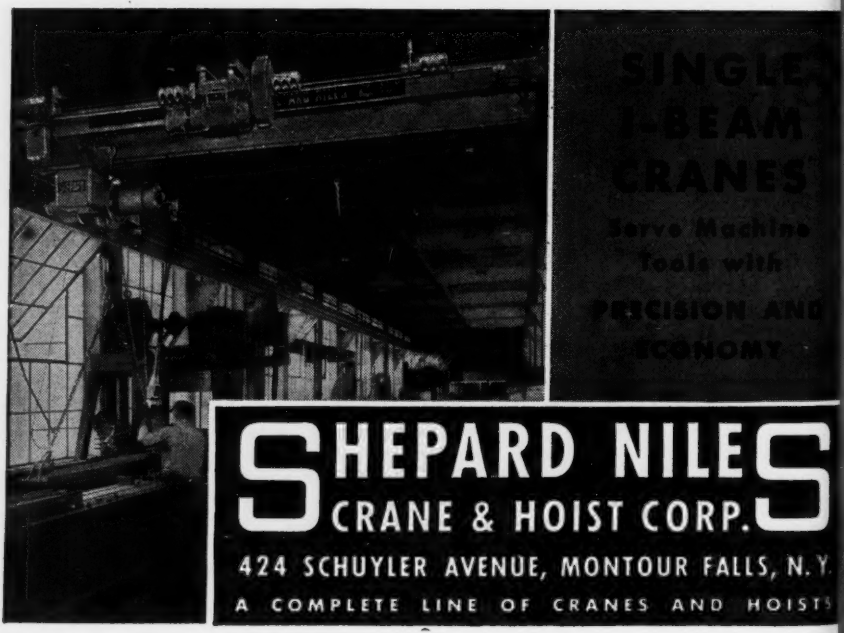
The operation consists of broaching two flats on the round shank of the brake coupling. These flats must be in correct angular relation to the hexagon on the coupling by which the coupling is held in assembling. To assure maintenance of this relation, the loading apertures are hexagon-shaped to guide the parts as they drop into the machine. As the parts feed into place for broaching, they are gripped by spring-loaded hexagon-shaped jaws. On the broaching stroke the ram pushes the part through the broaches, opening the jaws against their spring pressure. The teeth of the stationary broaches are so designed as to contact the pieces simultaneously, thus preventing the part from turning during the cutting operation.

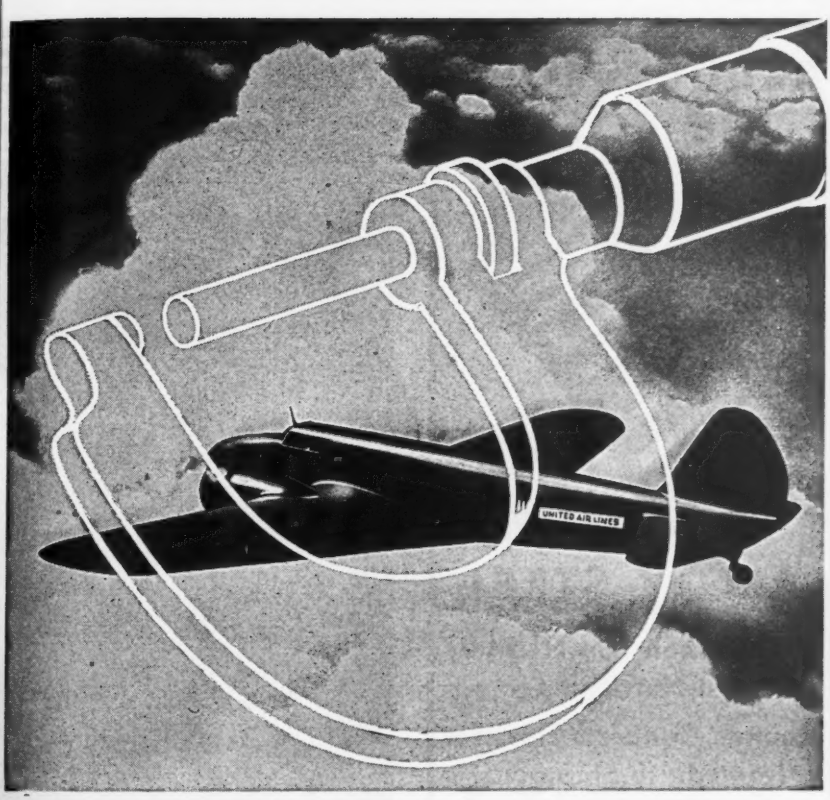
Hardened and ground guide rails contact the part on the bottom and sides during its travel, so as to maintain vertical and horizontal alignment. The stationary broaches themselves are a ranged in sub-bars, permitting rea removal in sections for ease of serv and replacement. The machine is equi ped with a heavy duty coolant pum the coolant ducts being so designed to flood continuously the space betwe the broach teeth, washing out the chi

The broaching machine has a 4-t capacity and an 18-in. stroke. Standa Colonial hydraulic operating units a used, driven through a 7½ h.p. mot The cycle is set to give a broachi speed of 45 ft. per minute, with a r turn speed of the ram of 90 ft. p minute. Since there are two sets broaches and two pieces are broach at one time, the maximum rated capa ity of the machine under continuo operation is 3,600 pieces per hour.

Cataract BB5 Precision Milling Machine

Designed for precision milling in th tool room and laboratory, Hardin Brothers, Inc., Elmira, N. Y., has brou out the Cataract BB5 Precision Milli Machine with Hardinge precision pr loaded ball bearing spindle constructio shown herewith. An outstanding featu





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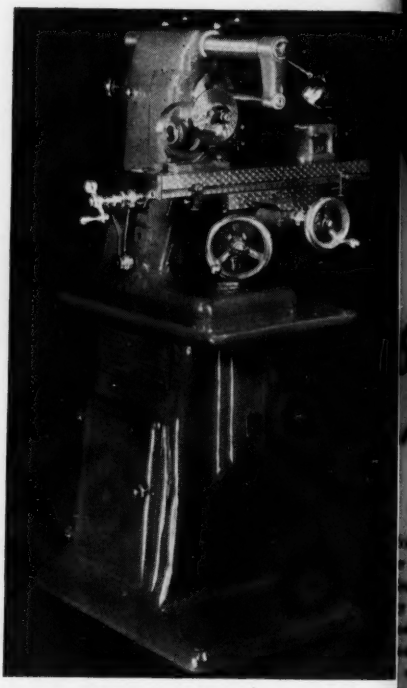
of the machine consists in the hig spindle speeds available; eight speed forward and eight speeds reverse fro 110 to 1,850 r.p.m. An enclosed V-be drive is provided with conveniently lo cated lever speed control. No gear clutches or loose pulleys are employe The feed screws revolve in long adjus able nuts and have friction dials gra



Cataract BB5 Precision Milling Machine

uated in thousandths of an inch. An enclosed headstock with "Connected Bearing" design is another feature. It adapts 1-in. round capacity collets and includes a notched draw spindle and spanner wrench. The machine is equipped with a sturdy table having a large working surface. The table has three slots for T-bolts to take attachments and fixtures. The working surface of the table is 20x6 inches.

The range of the machine is 13¾ in. longitudinal, 6 in. transverse, and 7 in. vertical. Maximum distance from center of spindle to table, 7 in. The spindle is of high grade ball bearing steel, hardened and ground, and designed to adapt 1-in. capacity standard 5C Har-

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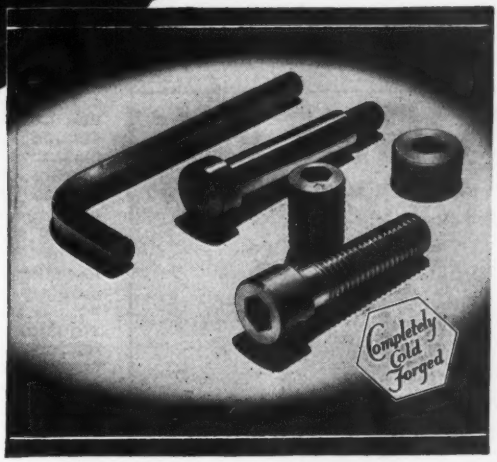

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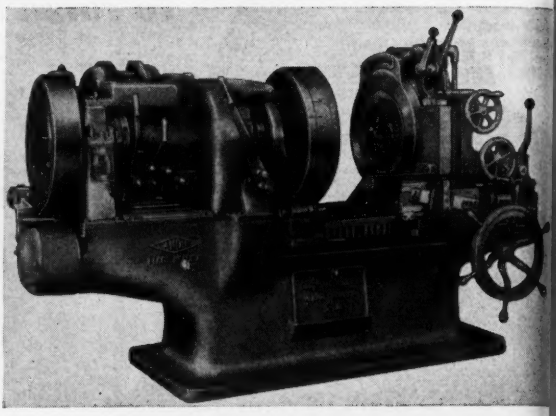
dinge Collets. The arbor is ⅞, 15/16 or 1-in. diameter, 7 in. long with spacers and nut. Floor space required, 45x43 in. Weight, 850 pounds.

Enclosed in the base is a standard two-speed reversible constant torque motor with endless V-belt connected to a four-step pulley to provide eight forward and eight reverse speeds. If desired, the machine proper may be mounted on a 48x30-in. braced bench driving unit.

Landis 4¾-In. Receding Chaser Pipe Threading and Cutting Machine



Landis 4¾-In. Receding Chaser Pipe Threading and Cutting Machine

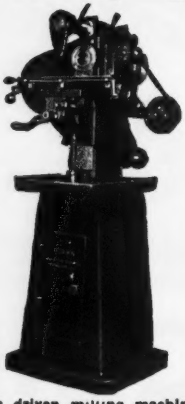
The Landis Machine Company, Inc., Waynesboro, Pa., has added another pipe threading and cutting machine with receding chaser die head to its line of threading equipment. The machine, identified as the Landis 4¾-In. Receding Chaser Pipe Threading and Cutting Machine, has a capacity from 1-⅝ in. O.D. to 4¾ in. O.D. It will generate a tapered pipe thread of any length up to and including 5 in. and will cut all tapers regularly used for plain pipe, and oil well casing, tubing and drill pipe on all sizes within its range.

The receding chaser feature of this machine is said to greatly reduce the cutting strain on the chasers to assure maximum chaser life, accurately tapered threads, and threads of excellent finish. It also permits the use of a very narrow chaser which lowers the initial cost of the chasers.

The die head used on the Landis Receding Chaser Pipe Machine is accurately graduated for all pipe sizes within its capacity. It has a universal adjustment for size and, in addition, a micrometer adjustment which makes it possible to obtain an extremely accurate setting. The graduations on the micrometer adjustment are spaced to give a variation of exactly 0.001 in. on the diameter. The die head is equipped with a roughing and finishing mechanism. Both the roughing and finishing cuts can be made without any dimetrical adjustment of the die head. The chaser-holders of the head can be adjusted independently toward or away from the center of rotation to insure an equal distribution of the cut.

The taper generated on the machine is controlled by a sine-bar. The sine-bar is quickly and easily adjusted for all tapers and assures uniform taper throughout the length of the thread.

BURKE Milling Machines



Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

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REPUBLIC STEEL

UNION COLD DRAWN STEELS

The sine-bar is located positively for all tapers by means of a tapered dowel pin.

The forward travel of the die head onto the work is controlled by means of a lead screw, which is centrally located between the guides of the machine. It has a coarse pitch thread with a rounded crest to facilitate the engagement of the nut and to insure maximum lift. An additional feature of the lead screw—one which doubles the life of the screw—is its reversibility. When one end of the lead screw becomes worn through use to the extent that the lead is not properly controlled, it can be reversed in its position to permit the use of the opposite end, thus making use of the full length of the lead screw.

As the die head advances onto the pipe, the sine-bar engages a retarding bracket on the side of the machine, thus actuating the taper mechanism. Since the length of the pipe extending in front of the chuck may not be constant, unless a work-stop is employed, the sine-bar retarding bracket is designed to be adjusted quickly to any desired location. An automatic safety device releases the sine-bar retarding bracket should the operator neglect to open the die head at the finish of the thread.

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The lead screw is of the split type and is made of bronze in two segments. It is mounted on a steel carrier which is integral with the carriage. The lead screw segments have direct contact and take the thrust load directly from the carriage. The lead screw nut is engaged by hand, but is released automatically at the end of the cut. A central reservoir located on the top of the carriage lubricates the lead screw automatically. A pitch indicator is provided to assist the operator in correctly engaging the lead screw nut where a second, or finishing, cut is to be made. One lead screw will handle all the thread pitches which can be cut on the Landis 4¾-in. Receding Chaser Pipe Machine. The various feeding speeds required are obtained by means of pitch change gears housed in a gear box on the headstock end of the machine.

The machine has a self-contained coolant system. The cutting coolant is directed to the cutting edge of each chaser through ducts located within the head body. An ample volume of coolant is provided to insure maximum cutting efficiency for the chasers.

Madison-Kipp "Cold Chamber" Die Casting Machine

To provide for production of die castings made from various alloys of aluminum, magnesium and brass, the Madison-Kipp Corporation, Madison, Wis., announces a 400 Series of "cold chamber" type die casting machine. The machine is made in three sizes. The smallest has a capacity for aluminum castings up to 0.9 lbs., including the casting and gate, while for brass the capacity is 1.5 lbs. for both casting and gate, and for magnesium, 0.6 lbs. The total injection pressure on the metal in the No. 400 machine is 19,000 lbs. The smallest size is the No. 400, the intermediate size is known as the No. 440, and the large size, No. 404. In some respects the machines are flexible so that both pressure and casting weights may be varied for special requirements. The total injection pressure on the metal for the intermediate size, No. 440, is 38,000 lbs. The weight of the gate and casting may be 2 lbs. in aluminum, 1.2 lbs. in magnesium, 5 lbs. in zinc, and 3 lbs. in brass. For the largest size, No. 404, the total injection pressure on the metal is 63,000 lbs., and the rated capacities of gates and castings in the various alloys are 3.25 lbs. in aluminum, 2.16 lbs. in magnesium, 7.4 lbs. in zinc and from 2 to 4½ lbs. in brass.

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Our No. 12 (illustrated above) and No. 7 Die Grinders, plus the two High Speed Portable Grinders and four Heavy Duty Grinders, give any die shop, stamping plant, tool room or metal working plant a group of precision-built tools ideally suited for the job.

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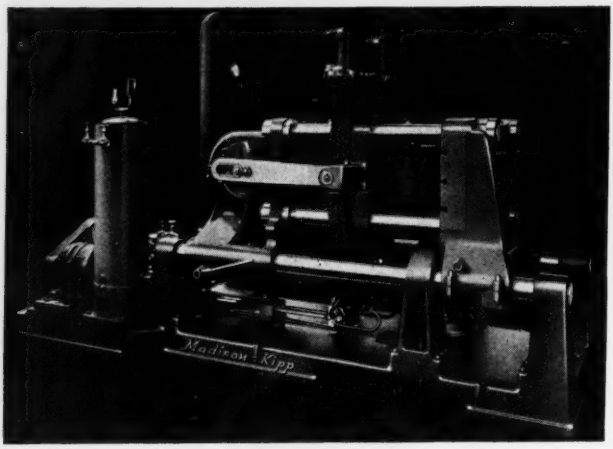
All of these machines are furnished with provision for applying ample pressure to force the molten metal into the die space by hydraulic power, and a powerful hydraulic locking mechanism holds the die closed during the casting period at the same time, eliminating all strain on the die-moving mechanism. The molten metal is handled in such



Madison-Kipp "Cold Chamber" Die Casting Machine

a way that there is no danger of contaminating the alloy with iron.

Those who are familiar with the previous Madison-Kipp die casting machines will recognize that the Series 400 machines are equipped with the same type of dwell-cam crank mechanism to accomplish the closing and opening strokes of the die carriage, and also the placing and the withdrawal of cores in and from the die. In the so-called "cold chamber" type of die casting machine a separate melting furnace and crucible are used from which successive shots of metal are ladled into a well under the die. According to the nature of the work, the machine may continue to run fully automatic, with a finished casting removed and a new shot of metal ladled into the well, manually, during each cycle. Or, if necessary, the operation may be interrupted by depressing a foot treadle at the completion of each cycle, in order to remove the finished casting and add a new supply of metal into the well.

T-J Compressed Air Booster

The Tomkins-Johnson Co., 620 N. Mechanic St., Jackson, Mich., has placed on the market the T-J Compressed Air Booster shown in the illustration, by means of which air line pressure can be raised a predetermined amount. The unit raises air of 80 lbs. pressure per square inch to 400 lbs. pressure per square inch. Five cubic inches of compressed air at 400 lbs. are developed by every single stroke (30 in.) of the cylinders. A 3-in. diameter bore cylinder is used in connection with a 1⅛-in. diameter bore cylinder.

The air from the unit is piped into a tank, from which it goes to the equipment performing the prescribed function. The unit was developed for use

KELLY

CRANK SHAPERS
HEAVY DUTY

Made in six sizes from 16" to 36" stroke, with motor or Single Pulley Drive. Revolving table and front support form part of standard equipment. Timken Roller Bearings throughout.

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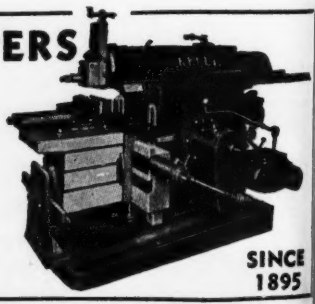
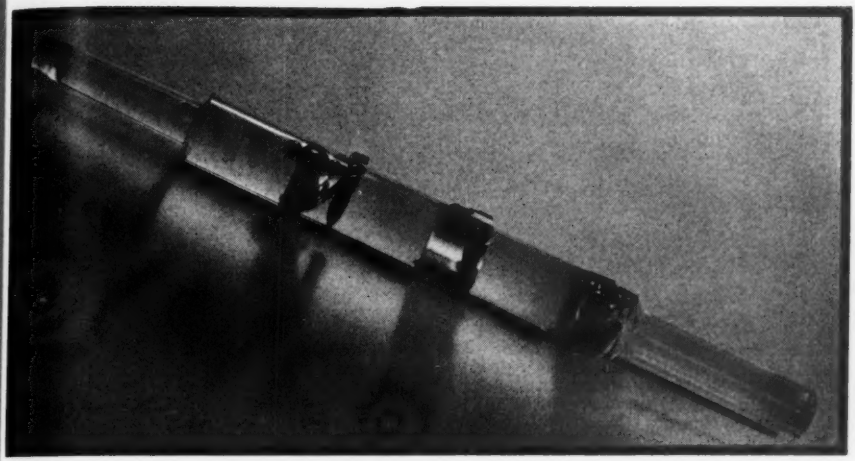
GENERAL ENGINEERING & MFG. CO
ST. LOUIS MISSOURI



SINCE 1895



This is a Combination DAVIS Boring Tool!

It happens to be made (except for the cutting units themselves) of transparent Lucite; and was designed for use solely as a "demonstrator" at tool conventions. But it does graphically illustrate the truly wonderful adaptability and possibilities of *specially-designed* DAVIS Boring Tools.

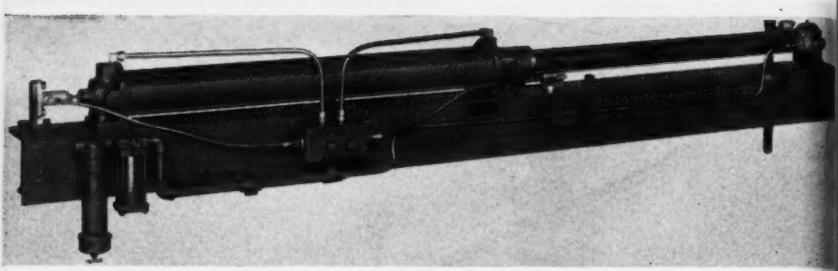
If you have an *unusual* boring job—a particularly *difficult* boring job—a *too-high-in-cost* boring job, it will pay you to find out just what specially-designed DAVIS Boring Tools can do for you.

Send us prints of your work, and let our Engineering Department make you a specific recommendation. No obligation. Write today.

DAVIS BORING TOOL DIVISION

Larkin Packer Company, Inc. **St. Louis, U. S. A.**

DAVIS BORING TOOLS



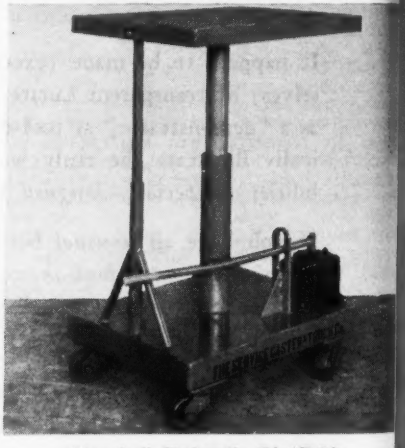
T-J Compressed Air Booster

in testing airplane strut cylinders. The booster may be designed to produce pressure to suit requirements.

The equipment incorporates the use of the T-J Remote Control Valve System. The action of the piston in the larger cylinder operates the buttons at both ends of the stroke, and these, in turn, operate the power valve to effect the reciprocating motion.

"Service" Hydraulic Die Table

A hydraulically operated die table of sturdy, compact construction and with powerful hydraulic mechanism, yet sa to be so light that one man can move about with ease, is now being made the Service Caster & Truck Co., 596 Brownswood Ave., Albion, Mich. Th table is intended for use in the tool die shop or in the stamping departmen and is designed for manipulation in nar row aisles. Platform size is 30x24 in. Th height on standard models, lowered, 30 in. and the lifting range extends in. above that for a total height of in. The lifting and lowering functio are controlled by means of the double-



"Service" Hydraulic Die Table

operative handle by which the hydraul mechanism is controlled. The liftin stroke is approximately 14 in. and onl 25 lbs. pressure is required. Standar models can be supplied for 500, 750 o 1,000 lbs. capacity, or custom built fo heavier loads if desired. The unit ca also be supplied with an electric motor

The running gear for the die table in-

SMALL TOOLS

Long Length Drills
Special Size Taps
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High speed and carbon drills, taps, reamers, milling cutters, hollow mills, end mills, drill rod, die sets, etc.

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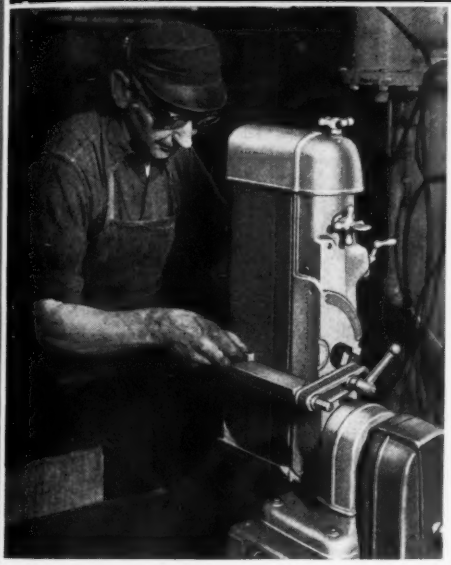
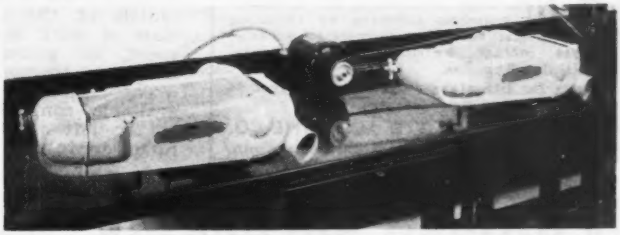
How Reynolds Cuts FINISHING COSTS



In the new and up-to-date Reynolds Molded Plastics plant at Cambridge you will naturally find Delta belt sanders specified for the Finishing Department. Naturally, because they have found that "the use of these machines is very advantageous because they can be shifted around to make different combinations as used in progressive line production." But that is only half the story. Delta sanders are low in first cost, but are engineered to stand up and take it in production. They are completely enclosed, so they practically eliminate hazards in operation. They are as nearly dustless as a sander can be made. They require no lubrication and practically no maintenance.

DELTA SANDERS OFFER YOU:

Reduced Costs
Increased Safety
High Production
Minimum Dust
Low Maintenance
Wide Adaptability



Two of the Delta belt sanders installed at the Cambridge plant of Reynolds Molded Plastics, ready for connection to blower system.

Delta Sanders can be used either vertically, as above, or horizontally, as at right. They are adaptable to a wide range of small-parts finishing, either in metals or plastics or a combination of the two. You do not realize how efficient a modern sander can be until you have investigated this machine. Write today for complete details and prices.

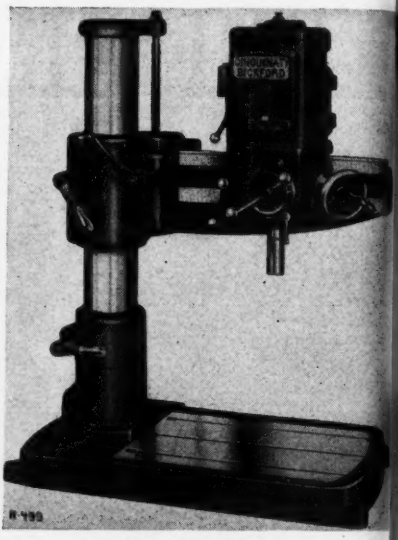
DELTA MANUFACTURING Co.

638 E. VIENNA AVE., MILWAUKEE, WIS.

cludes Service ForgeWeld Casters with 4-in. wheel. These casters are made from tough 1045 SAE steel with the top plate and king-bolt drop forged integral, with high pressure lubrication fittings for both swivel and wheel, and a double ball race in the yoke for easy swiveling. Hyatt roller bearings are provided in the Ni-Steel-Iron wheel.

Cincinnati Bickford 2½-Ft. High Speed Super Service Radial Drill

The illustration shows a 2½-ft. High Speed Super Service Radial Drill with 7½-in. diameter column which has bee developed by The Cincinnati Bickfor Tool Company, Oakley, Cincinnati, Ohi especially for manufacturers whose wor



Cincinnati Bickford 2½-Ft. High Speed Supe Service Radial Drill

includes much small drilling and tap ping in fairly large parts. This ma chine is intended to supersede lar upright drills or less efficient belt drive radials of the sensitive type for th class of work indicated, and is a hig speed, all geared, small radial dri adaptable to the production line.

Three changes of spindle speeds a available, controlled by the upper lev at the left of the head. With a 12 r.p.m. driving motor, either A.C. or D.C

GRANT RIVETERS

Pioneers in the riveting field. Head rivets from smallest to ⅝" diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles.

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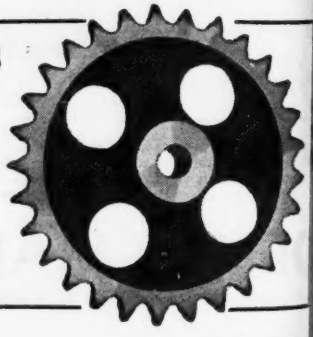

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Good gear cutters in all parts of the country rry Formica gear material in stock and can cut e or many gears promptly for replacement purses. Try one the next time you need a gear.

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West Point, Ga.
Worcester Gear Works
Worcester, Mass.
Massachusetts Gear & Tool Co., Woburn, Mass.

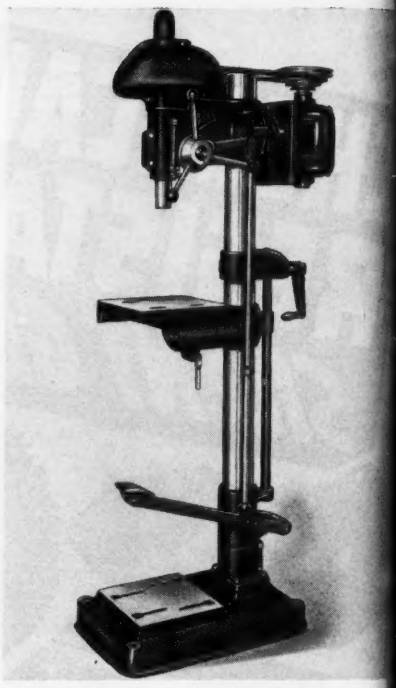
anyone of several speed ranges is optional, the change being made through pick-off gears. Six spindle speeds are available by using a two-speed A.C. motor, which will be controlled by a convenient fast-slow-stop switch mounted on the head.

Three rates of power feed — 0.003, 0.006, and 0.009 in. per revolution of the spindle — are instantly selected by setting the indicator lever at the center of the head. This all-geared feed change unit is mounted on anti-friction bearings, is automatically oiled and makes use of integral key multiple splined shafts and heat treated chrome nickel steel gears. The feed case is an aluminum alloy casting. Power feed is engaged by quick return levers directly above the spindle which are also used for hand feeding. The control lever for forward-stop-reverse of spindle rotation is located at the lower left side of the head and operates from built-in push buttons controlling the small 1 h.p. totally enclosed reversing motor. The head is mounted on ball bearing rollers and hardened steel armway.

The head is fully enclosed and contains a constant speed rotary lubricating pump. The sliding gears are of heat treated chrome nickel with ground teeth and all shafts are ground, multiple splined and mounted on anti-friction bearings. The spindle, which is chrome nickel steel, is mounted on precision anti-friction bearings. The feed rack is an integral part of the spindle sleeve and the spindle and sleeve are counterweighted for fast, easy operation.

"Buffalo" No. 18 Drilling Machine

A line of drilling machines identified as the No. 18 and available in 18 different models is now being built by Buffalo Forge Company, 388 Broadway, Buffalo, N. Y. This line of drills was designed to meet the specific need of



"Buffalo" Model I No. 18 Drilling Machine

metal working industries for an accurate, powerful and economical drilling machine. The machines are said to be bare of decoration but are said to have the features which are necessary for accurate work and long service, such as a 0.9375-in. chrome nickel alloy spindle, a large heavy column, and large and accurate working surfaces. The spindle bearings and spindle sleeve bearings are

. . . for more than 1001 odd jobs

The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

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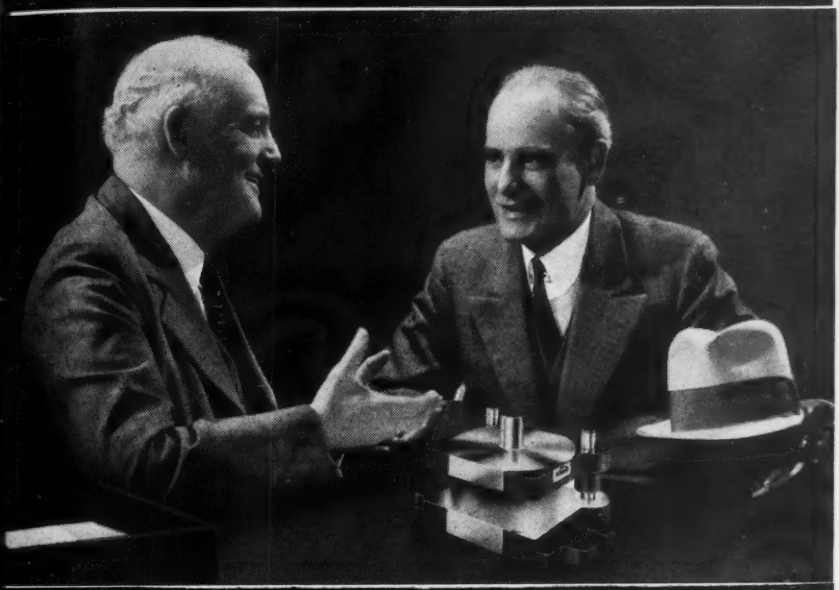

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Saving in the cost of die sets is one of the most expensive forms of tool room economy. Just a few more thousand pieces per regrinding more than pays for the extra value of the Precision Set. The cost of one production line tie-up, one die smashed would make up for a "precision appropriation" for an industrial lifetime.

Precision Pays. Shearing is the continual destroyer of die surfaces—offset it with the ±1/10,000" accuracy of Danly Precision Die Sets.

Precision Pays. Specify Danly Precision Die Sets and you have it.

DANLY MACHINE SPECIALTIES, Inc., 2112 So. 52nd Ave., Chicago, Ill.

DANLY PRECISION DIE SETS

fully adjustable to add to the life of the drill.

The No. 18 drill is available in 18 models identified by letters from A to S. The No. 18-A is a production type machine with oil groove table, head-raising device and table-raising screw. The No. 18-B is the same but without the foot feed. The No. 18-P is a two-spindle machine with production base, bench type, equipped with head-raising device. No. 18-Q is a three-spindle machine of the same type. No. 18-R is a four-spindle machine and the No. 18-S has six spindles. All models have 18-in. swing.

The head frame is large and heavy and is split in front with adjustment for wear of the spindle sleeve bearing. The multiple spline spindle is of nickel alloy steel, ground, polished and balanced. The spindle nose has a No. 2 Morse taper, although other tapers can be provided. The spindle rotates in two precision type ball bearings, the lower being a double row ball bearing to take the thrust of large drills. The rack is cut integral with the sleeve and slides in an exceptionally long bearing. Adjustment is provided for spindle bearings and for the frame bearing. The spindle pulley is mounted on precision type ball bearings.

The table-raising screw is full b bearing and is actuated by a machi cut steel screw and machine-cut s gears. Three ball thrust bearings m for easy operation. The foot feed ha 2-in. stroke. The lever connecting t gears is ratchet-mounted so that t entire foot feed can be disengaged turning a knurled nut.

The capacity of the No. 18 machi in cast iron with a ¾ h.p. motor 1 in. Feed travel is 5 in. and t center of a 18-in. circle can be dril Working surface of the table is 14 in. on the A, B, C and D models w 12x12in. on the rest. Column diame is 4 in. and spindle diameter is 15 in. Speeds range from 265 r.p.m. on t A, B, C and D models with a 1,140 r.p motor to 6,000 r.p.m. on the O, P, R and S models with a 3,450 r.p motor.

Stanley Electric Screw Driver

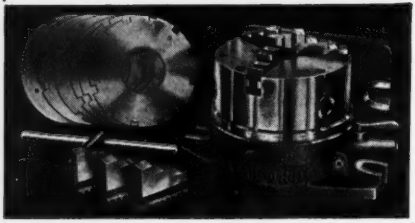
Stanley Electric Tool Division, N Britain, Conn., announces two porta electric screw drivers, designated as

Stanley Nos. 02 and 02H Electric Screw Drivers

Nos. 02 and 02H, for use wherever a sembly work is done with screws or nu Advantages of the screw drivers are s to be their light weight, compactn and balance, which permit their use close-quarter and long-reach work.

Both sizes of screw drivers are av able in four driving speeds and a equipped with a patented adjusta tension clutch. The No. 02 has an e closed "on" and "off" switch mount in the rear end bell. The No. 02H h an automatic pistol-type handle with double pole, trigger-type switch.

For Fast-Accurate Indexing



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FOOLPROOF—mask plates prevent errors.
RAPID INDEXING—release clamp, withdraw index plunger, revolve turret.

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Hartford Special Machinery Co.

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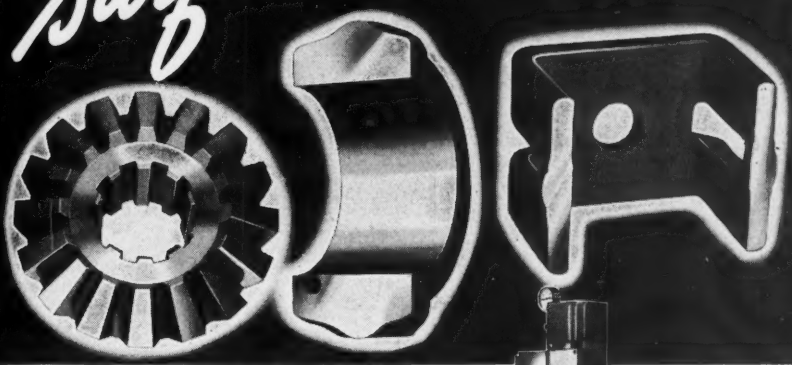
Surface broached



THE MODERN MACHINING METHOD

● Many tough machining problems are handled today by Footburt surface broaching methods. Production heretofore impossible with one machine, accuracy and finish previously unobtainable in one operation, combined with an exceptional tool maintenance economy make Footburt surface broaching a means to lower manufacturing cost that should be investigated by every production executive.

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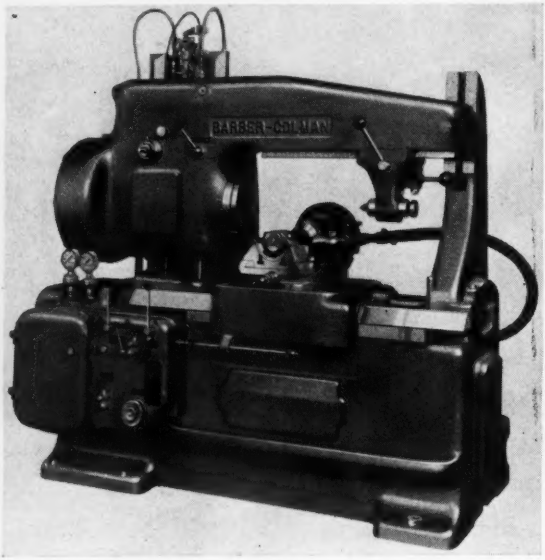
THE FOOTE-BURT COMPANY
CLEVELAND, OHIO

FOOTBURT

Detroit Office: 4-151 General Motors Building

Barber-Colman Type D Hydraulic Hobbing Machine

Designed for accurate, heavy duty, high production hobbing, Barber-Colman Company, Rockford, Ill., has brought out the Type D Hydraulic Hobbing Machine. The design of the Type D incorporates pioneer applications of hydraulic pressure for actuating hobbing machine elements. The machine is said to be easily set up, have unusually high productive capacity, and is built to new standards of durability and low-cost operation.



Barber-Colman Type D Hydraulic Hobbing Machine

The bed houses a hydraulic pow plant and the electrical accessories, a also contains reservoirs for hydraulic and coolant. Supports in the bed p vide for the direct-connected drivi motor, automatic lubricator, and in pendent motor driven coolant pump.

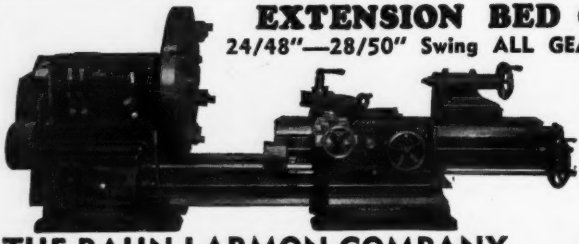
Operating controls grouped in a conveni housing. The hob slide be inched and the spin rotated continuously jogged independently in engagement from the au matic cycle.

The rate of hydrau feed can be established changed at any time means of the adjusting and any feed rate whate from standstill of the slide to the maximum f rate of 2 in. per min., be secured instantly. draulic equipment provi left-to-right climb cutt or conventional hobbing simple manual adjustme on the control panel. versal of feed direction p vides corresponding cha of rapid traverse in the a tomatic cycle. The depth cut is established preci by the contact of two ha ened steel stops, one which has micrometer a justment.

A differential for hobbi helical forms is an integ part of the design. Cha gears are cascade lubricated, complet enclosed in an oil-tight housing readily accessible. Direct reading ga indicate accurately the clamping a feeding pressures in the hydraulic c cuit. The work spindle drive housi work slide and overarm are integral a one-piece casting. Accurate double

EXTENSION BED GAP LATHE

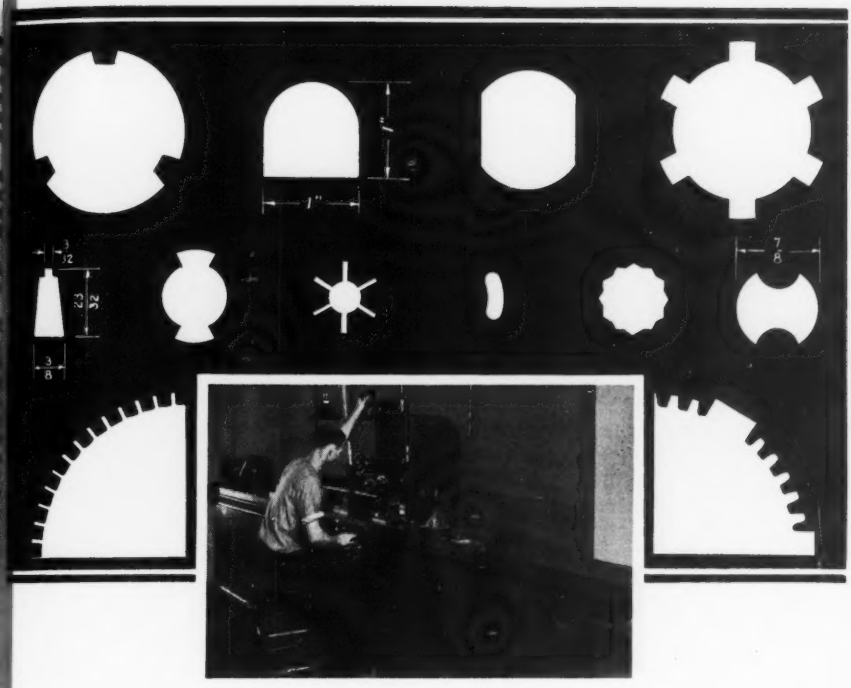
24/48"—28/50" Swing ALL GEARED OR CONE HEAD



A lathe for small an large swing work. Lon distance between cen ters. Three lathes i one. Saves space. R duces cost.

Write for literature.

THE RAHN LARMON COMPANY **Cincinnati, Ohio**



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INTERNAL BROACHES

Experience . . . equipment . . . and the result—internal broaches that meet the most exacting production requirements wherever they are used. Detroit Broaches produced all of the forms shown above. These forms are illustrated merely as typical examples of the wide variety of splines and unusual internal forms which are being broached with equipment manufactured by this company. Except by bench work, none of these forms could be produced by other than broaching operations.

To facilitate the manufacture of this type of broach, the Detroit Broach Company uses equipment specially designed to handle work of every size and description. Typical of this equipment is the grinder illustrated above which can be used for broaches up to six feet in length.

Detroit Broach engineers and production men are thoroughly familiar with the "fine points" in the design and manufacture of internal spline broaches. They know the answers to your broaching problems. Your inquiries are always welcomed and will be answered immediately and intelligently—without obligation on your part, of course.

DETROIT BROACH COMPANY

6000 Beniteau Ave. • Detroit, Michigan

ways on the column center the work slide and maintain its alignment. Powerful hydraulic clamps lock the work slide overarm in position with equalized pressure at five points. The hob spindle is extra heavy, hardened, ground, and mounted in precision bronze bearings independently adjustable. Helical gears insure a smooth, powerful hob spindle drive. Automatic pressure lubrication is provided to all bearings not lubricated by the hydraulic system.

The capacity of the machine is: maximum diameter, 14 in.; maximum face, 14 in.; diametral pitch in steel, 3 in. Maximum travel of hob slide is 15 in. Maximum hob diameter, 5½ in. Maximum hob length, taper spindle, 4 in.; straight spindle, 5 in. Hob spindle speeds, 62, 75, 88, 103, 130, 150, 174 and 240 r.p.m. Taper in nose of work spindle, No. 18 B&S. Diameter of hole through spindle, 3⅛ in. Maximum feed, 2 in. per minute. Motor recommended, 10 h.p., 1800 r.p.m. Floor space required, 108½x59 in. Base dimensions, 70-11/16x 38¾ in. Weight, net, 9500 pounds.

Cimatool No. 2-B Burring Machine

To accurately burr gear teeth at speeds up to 800 teeth per minute, the Cimatool Company, Dayton, Ohio, has engineered the No. 2-B Burring Machine illustrated herewith. Utilizing a fly cutter on each of two cutter spindles, the No. 2B will burr both sides or front and back of gear teeth on gears up to 8 in.

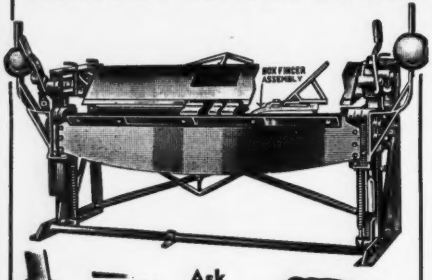
Cimatool No. 2-B Burring Machine

O.D. Other models are available for other size gears.

The main drive is multiple V-belt and speed changes are rapidly made by changing pulleys. The main drive revolves two trains of constant mesh gears, one of which drives the two cutter spindles mounted on a vertical column (vertically adjustable 3¾ in.) in the center of the machine in which the cutter spindle driveshaft is enclosed. The cutter spindles are mounted horizontally and opposed, and each may be adjusted laterally toward and away from each other 1½ in. and from front to rear through a 60-deg. arc to obtain practically any burred gear tooth face within machine capacity. The quick change "timing" adjustment for set-up is conveniently located on each cutter spindle, allowing adjustment 1/600 of a turn.

The work gear indexing idler swings upward and to the left to accommodate different size gears. This idler is driven

WHITNEY-JENSEN BRAKE



Ask for Cat. No. 11

No. 4 Angle Iron Shear

No. 8 Imperial Punch

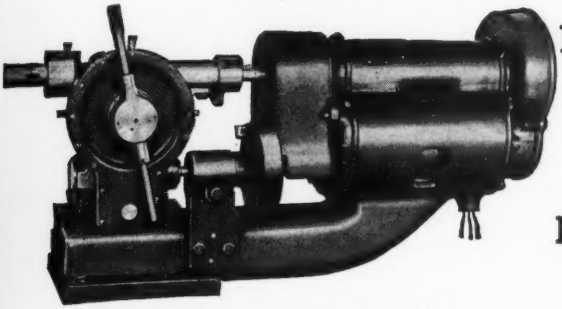
Whitney Metal Tool Co.

91 FORBES ST. ROCKFORD, ILL.

Quality Tools - by *Avey*

for good drilling - good tapping

Let Us Figure On Your Complete Sensitive Drilling Equipment.



Type B Motor Driven Drilling Unit

Machines
Fixtures
Tools
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PRODUCTION

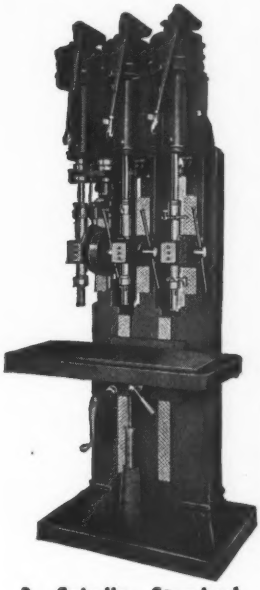
Vertical or Horizontal — Standard or Special Purpose Machines with Hand, Power or Automatic Feeds.

GET THE BEST

It Pays in the Long Run.

Ask for Catalog and Estimates.

The Avey Drilling Machine Co.
Cincinnati, O.



3 Spindle Standard Motor Avey Machine

through the second train of constant mesh gears mentioned above and is positively synchronized with the cutter spindles so that the machine can not get out of "time", eliminating scrap otherwise frequently encountered with the use of index plates, ratchets, pawls, and so on.

A unique feature of the machine is the automatic cycle control which stops the spindles in such a position that the work may be unloaded and loaded without interference from the cutters or without manually positioning the cutters. Other features include Timken tapered roller bearings throughout, pr sure lubrication of all bearings points where wear may occur, and built-in. coolant system. Clamping the work is optional and may be acco plished by means of a manual hydra or air-operated fixture.

Change-overs are said to be quick and easily effected, since only a cha in pitch can make necessary a cha in the idler gear. Gears of identi pitch with different numbers of te merely require adjustments and sim adapters.

U. S. Model No. 500 Grinder

In addition to the Model No. Grinder which was recently announ by the U. S. Electrical Tool Co., 2 West 6th St., Cincinnati, Ohio, this f is introducing the Model No. 500 of grinders. The machine is called

U. S. Model No. 500 Grinder

New U. S. Utility Ball-Bearing Mo in-Head Grinder and is available in sizes from ¾ to 5 h.p., in three ph 50 to 60 cycle, 220 or 440 volts. Gri ers of 25 or 40 cycle can also be s plied.

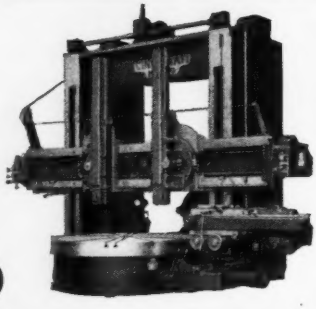
The Model No. 500 Grinder is equip with a polyphase, totally enclosed m and is said to start instantly to speed. No dirt, dust or abrasives reach the bearings, motor windings rotor. The anti-friction ball bearin permanently lubricated, are enclo Wheel guards are of the hinged t enclosed with the exhaust connecti and are adjustable to wheel wear. tool rests, which are adjustable, mounted on the pedestal. A heavy

GRAY TURRET HEAD METAL CUTTER OR NIBBLER

Cuts all metals any shape—30 gauge up to 1".

GRAY, Originator of First Practical Metal Cutter or Nibbler. GRAY Cutters Still Lead.

GRAY MACHINE CO.
Dept. A., P. O. Box 596, Philadelphia, Pa.



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THE CINCINNATI PLANER CO.
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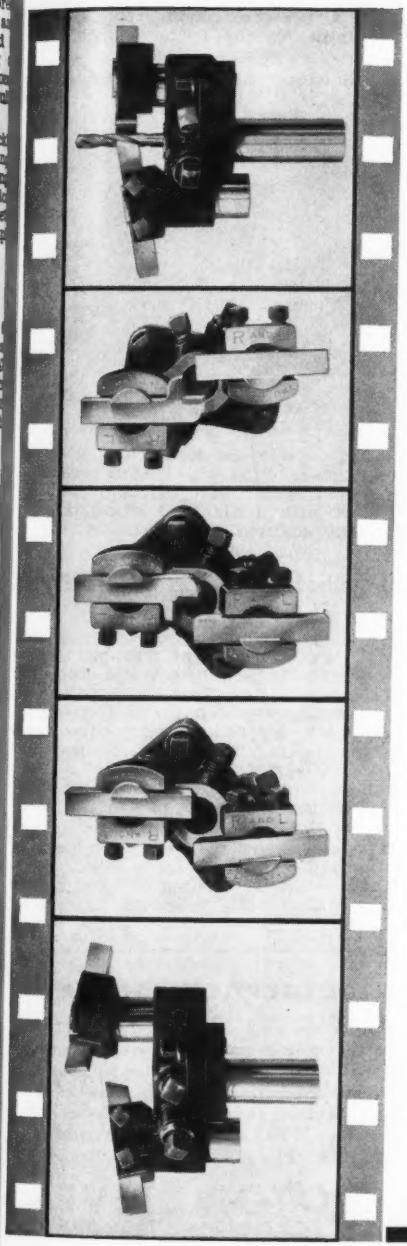


R e e L

ECONOMY

1 R & L TOOL takes the place of 7 ordinary tools

The new R & L Turning Tool is a combination of seven tools. It can be used for roughing and finishing cuts, right or left hand—as a balanced turning tool with two cutting edges — as a combination turning and burnishing tool — for simultaneous drilling and turning. This money-saving tool can be changed from Right to Left or Left to Right in ten seconds—an exclusive patented feature.

Why pay $300.00 for an assortment of right and left hand tools when you can get a modern R & L Turning Tool capable of producing the same amount of work at an initial cost of $65.00?

Write for Bulletin.

R&L TOOLS

1825 BRISTOL ST.

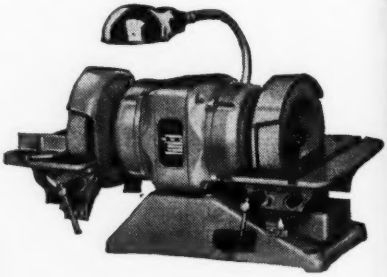
NICETOWN, PHILADELPHIA, PA.

tended shaft gives ample room for two operators. The grinder is furnished complete with a tool tray, a water pot of the lift-out type, and a push button starter with overload protection. The grinder is so constructed that the wheels can be removed quickly.

Baldor Carbide Tool Grinder

The Baldor Electric Company, 4380 Duncan Ave., St. Louis, Mo., announces several changes in the construction of the Carbide Tool Grinder marketed by this firm. Standard equipment now includes a protector type tool support which indicates the angle at which the tool is being ground.

In addition, the tool rest tables are



Baldor Carbide Tool Grinder

now adjustable so that they may be moved towards the wheel, thus providing for wheel wear. The grinder can be supplied with a diamond wheel dresser especially adapted to the grinder.

Klingelhofer Electric Metal Hand Saw

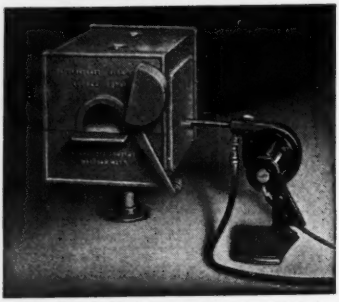
An electric hand saw for use in sawing metal, labeled the Type GES-52, is now being made by A. Klingelhofer, Inc., 10 Lafayette St., New York, N. Y. The saw is especially intended for use on structural work, air conditioning equipment, automotive car and truck bodies, and so on. It is said to be possible to make clean cut-outs on finished surfaces without bending the edge of the metal or marring the finished surface.

The saw is powered by a universal type 110 or 220 volt ball bearing motor, operating the saw at a speed of 1,000 strokes per minute. While intended for normal

"Stark"

"ELECTROBLAST"

High Speed Heat in 20 Minutes

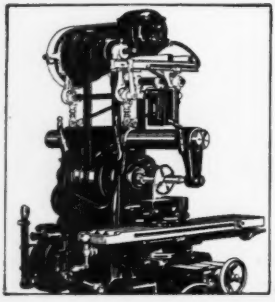


Powerful torch used separately as a very handy portable flame, $40. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3½"x2½", $40. Also a larger furnace with built-in torch, muffle 7"x4⅝"x3½".

STARK TOOL CO.

Originators of the American Bench Lathe

Est. 1862 WALTHAM, MASS.



Takes any motor-new, or used

Put your idle motors to work on a Remco Motor Drive. Its universal motor mounting will accommodate those of reasonable size. No holes to locate, or bore. Motors switched instantly, in case of a "burn out." Only Remco has this money-saving feature. Get details—WRITE! Remco Products Corp., State & Hay Sts., York, Pa.

REMCO MOTOR DRIVES

7 *out of* 13

LEADING MAKERS of* CALCULATING MACHINES

..... *use* **OAKITE** *Certified Cleaning*

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Precision built . . . attractively finished . . . today's calculating machines require cleaning at many steps in their production.

For instance, on such work as the removal of quenching oils, tumbling of parts to remove hardening salts, cleaning frames before Bonderizing, cleaning parts before painting or plating, Oakite materials are being daily applied in the plants of SEVEN of the THIRTEEN manufacturers of adding and calculating machines rated AAAA in Thomas' Register.

As in other plants where mass production must be achieved, where cleaning speed and uniform effectiveness must go hand in hand, Oakite materials are proving their worth in lessened time delays, fewer rejects and lowered unit costs.

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On your work too, you will find "It pays to change over to Oakite". Our nearly 30 years' experience in all types of metal cleaning is at your disposal. Why not let us give you the helpful suggestions we can offer on your cleaning and related operations.

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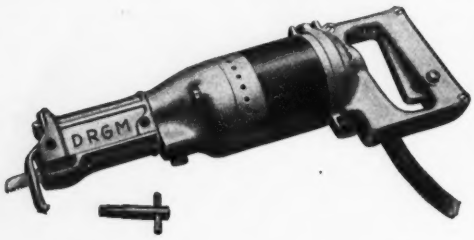
OAKITE MATERIALS & METHODS *Certified* **CLEANING** FOR EVERY CLEANING REQUIREMENT

use on sheet steel up to 14 gauge, it can be used for material up to ¼ in. thick. It is said that 18 gauge steel can be sawed at a speed of 24 in. per minute



Klingelhofer Electric Metal Hand Saw

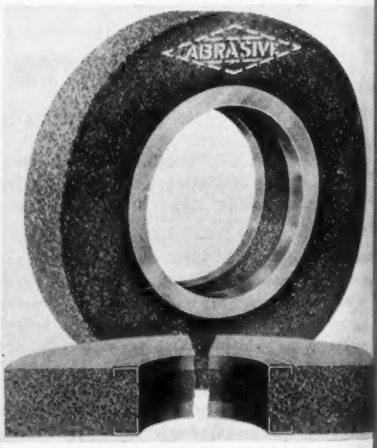
or 14 gauge at a speed of 8 in. per minute. Standard equipment includes one gage, three guide anvils, 10 extra saw blades, and 10 ft. of three-wire cable and plug. Weight, /8 pounds, 5 ounces.

Red Streak Flanges

A major physical improvement in large hole high speed resinoid bonded grinding wheels for rough snagging operations has been announced by Abrasive Company, Grinding Wheel Division of Simonds Saw and Steel Company, Philadelphia, Pennsylvania.

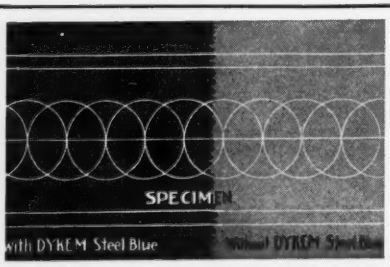
The improvement consists of two circular steel flanges of plate permanently embedded and bonded into the sides of large hole resinoid bonded wheels immediately adjacent to and surrounding the center hole and lining a portion of it. These are identified as "Red Streak Flanges." Each flange is an independent unit in perfect alignment with the other and consists of: (1) a flat, circular steel surface disposed flush in the side of the grinding wheel surrounding the center hole; (2) an edge flange lining a portion of the center hole and (3) a portion extending into the grinding wheel itself parallel to the axis of rotation.

Advantages claimed for such flanges include reduced wear on mounting flanges and mount center since steel is against steel. The center hole dimension is held to accurate tolerance, providing a more perfect fit and the wheel



Red Streak Flanges

is held between solid plane bearing surfaces, making the use of gaskets or blotters unnecessary. Visibility of flange instantly identifies the wheel as a high speed wheel suitable for operation up to 9,500 surface ft. per minute. Protection is afforded the center hole, thereby preventing the sides or edges of the hole from being chipped out when



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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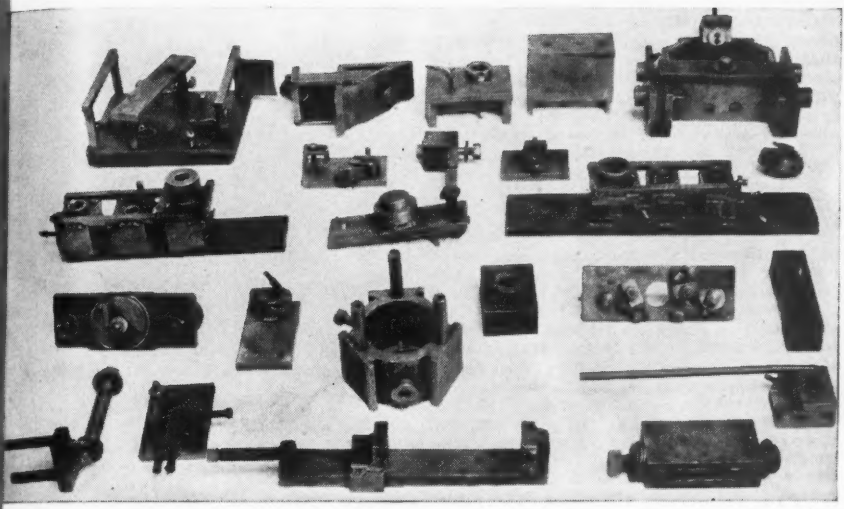
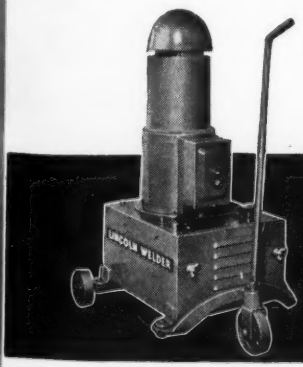


"SAVINGS ON JIGS ALONE SOON PAID FOR OUR LINCOLN WELDER"

Machine shops are saving $50 to $300 monthly with the new Lincoln Machine Shop Welder. One user reports, "On one order of jigs and fixtures alone, by welding them we saved more than the cost of our Lincoln Welder. We cannot find words enough to praise this machine. We use it many times every day for building or repairing machine parts, jigs and fixtures, and for hard-facing tools and dies."

This Lincoln Welder is of d. c. motor-generator type, so it can be used for alloys and non-ferrous metals as well as for mild steel work. It is always handy, going to work at the press of a button, and it uses less than 10¢ worth of power per hour.

Start getting the increased earnings this new welder affords. Consult the nearest Lincoln office, or mail the coupon for details.



THE LINCOLN ELECTRIC CO.

Largest Manufacturers of Arc Welding Equipment in the World

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Send a free copy of Bulletin 314 and payment details on the Lincoln Machine Shop Welder.

Name _____ Position _____

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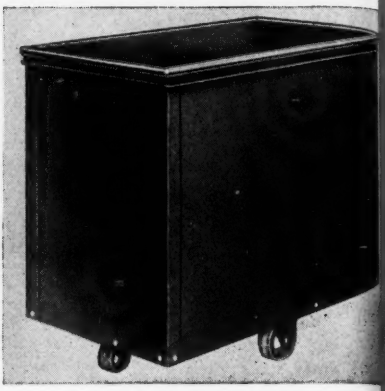
mounting or handling the wheel.

Grinding wheels of the type described here find their application on rough snagging operations in foundries and steel mills for cleaning castings and billets on swing frame and floor stand grinders. Red Streak Flanges are available in wheels 24 in. in diameter by 3 in. thick by 12 in. hole size.

Stackbin Box Truck

Unusually low cost is a prime feature of the heavy duty industrial box truck recently developed by the Stackbin Corporation, 53 Troy St., Providence, R. I. It incorporates all of the unusual features of the Stackbin line of box trucks for textile mills, plus heavy, rugged construction to insure long life under severe use.

The Stackbin truck is made of two separate units, designed to give unusual strength with a minimum of dead weight. The chassis unit consists of a heavy channel steel frame, to which are bolted the four casters. The frame distributes the load evenly to prevent twisting or bending. The body unit is built up of 16-gauge sheet steel sides and an inverted bottom of 14-gauge steel. The bottom fits down over the chassis, so that no bolts or rivets a pear on the inside of the body. The sides are rolled to a 5/8-in. bead, j under which is welded a reinforc channel steel section encircling the e tire body to eliminate corner moveme This construction keeps the inside a top edges of the truck perfectly smoo free from sharp edges or burrs. The n



Stackbin Box Truck

PROCUNIER HIGH SPEED TAPPING HEADS for TROUBLE-FREE TAPPING

PROCUNIER builds the kind of tapping heads that give you the utmost in production, accuracy and service. PROCUNIER heads make you forget all your tapping troubles. Only PROCUNIER has all these big features:

Dry, double-cone friction clutch that won't wear out and can't absorb oil . . . . TRU-GRIP Tap Holder, the most practical Tap Holder that ever held a tap, smaller, lighter, more accurate . . . . Ball Bearings . . . . Balanced heat treated planetary type reversing mechanism greatly reduces strain . . . . Write for literature.

PROCUNIER SAFETY CHUCK CO.
12 SOUTH CLINTON ST. CHICAGO, ILL.

Band Saw Efficiency at its peak — It's a WELLS!

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3 Speed Control

THE Wells Metal Cutting Band Saw is the ideal unit for all-around cutting jobs. It cuts metal speedily in any shape with extreme accuracy. You can use it to advantage in any part of your plant or shop because of its versatility. Send for a folder and really learn what a Wells Band Saw can do for you.

Built in Two Sizes:

No 5 Size—5" diameter round or 5"x10" flat.

No. 8 Size—8" diameter round or 8"x16" flat.

● Saw it the WELLS Way ●

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Uses 200 different accessories, quickly interchangeable in easy-working chuck.

Actually, a Whole Shop full of Tools in One. And, it's portable, so you can take it to any job, plug in AC or DC socket, 110 volts, and go to work.

A real time and money saver in factories, repair shops, model and tool rooms, in laboratories etc. Used for precision work on delicate mechanisms—to repair machine parts without dismantling machine — on the production line, for work on all metals, alloys, glass, resins, composition materials, wood, bone, stone, etc.

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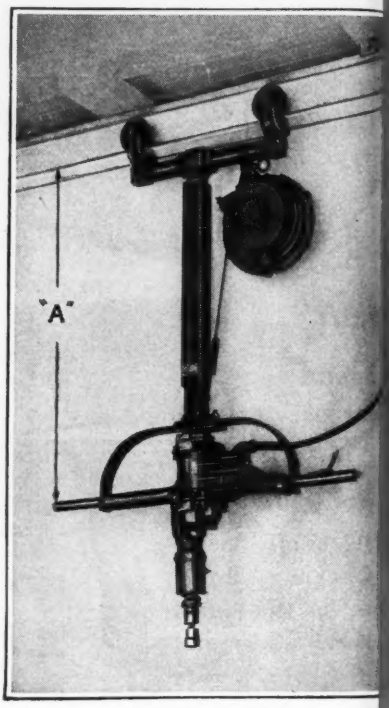
Stackbin truck is available in any quired size.

Thor Torque-Arm Balancer

A device for suspending large, powe ful electric and pneumatic drills, n setters and other tools above the worki location has been announced by the I dependent Pneumatic Tool Company, W. Jackson Blvd., Chicago, Ill. Known the Thor Torque-Arm Balancer, t



Thor Torque-Arm Balancer

equipment not only supports the to but also is said to absorb the torq and completely eliminate the danger injury to the operator when the to "sticks." Ease of handling and positi load control are obtained because t balancers are adjusted to balance working position. No effort is required lift or hold the tool or "fight" the torq

The Torque-Arm Balancer is made wi a range of travel from 3 to 6 ft. and load capacity from 45 to 100 lbs. Co plete weight of the unit is 143 pounds

Both sides are "TOPS"

ON TAFT-PEIRCE *Duplex* BENCH BLOCKS

Taft-Peirce Bench Blocks have twin surfaces—accurately ground—one of which may be used for working purposes, the other reserved for reference or inspection, if desired. These plates have many uses — are often used as ready-made bases for small fixtures and tools.

Made of well seasoned cast iron, thoroughly ribbed, they can be furnished grooved for lapping or handscraped on one or both sides at a slight extra charge. Carried in stock ground only, size 10″ x 14″ x 2⅜″. Weight 40 pounds. Special sizes on order. WRITE FOR PRICES

THE TAFT-PEIRCE MFG. CO. *Woonsocket, Rhode Island*

Several features combine to provide complete flexibility of operation in the Torque-Arm Balancer. The Torque Arm telescopes to allow the maximum amount of travel when open and the minimum head room when closed. It is attached at the top to the load frame in a rocking bracket that permits the tool to be swung backward or forward to either side. A yoke bracket at the bottom of the Torque Arm accommodates all shapes and sizes of yokes, and yokes can be furnished to attach to tools in any convenient manner.

The telescoping tube is square so that tools may be suspended either vertically or horizontally. Each telescoping arm is provided with a limit stop which acts as a double safety device.

The Thor Torque-Arm Balancer is adjusted to balance at working level. When not in use the balancer is raised to top position where it locks automatically, holding the tool above the operator and providing ample clearance below. When the tool is wanted at suspended working position again, the balancer is released by a lift and jerk to start the load downward.

The Thor Torque-Arm Balancer is said to fill a distinct need for users of large size tools. Advantages stressed by the manufacturer include convenience, dependability and ease of handling.

Jackson Eyeshield

A new means of eye protection in connection with many types of industrial processes is afforded by the Jackson Eyeshield, a device that, while not intended to replace goggles for all uses, is claimed to be better in many instances.

A new means of eye protection in cover-all eyeshield consists of a comfortable, light headgear to which is attached adjustably an assembly consisting of lens frame (A) and two side protection members (BB). The entire assembly can be pushed up out of the way (C) when not in use. The lens frame swivels (D) to adjust the lens angle and provision is also made for the easy adjustment of the distance of the lens from the face. Standard Federal Specification lenses are used, protected by cover glass.

The eyeshield is made in three types. One type for blow torch work, gas cutting and general maintenance welding has the lens frame and side pieces of light, opaque material, the frame fitting the face closely and comfortably. Another model, for the use of men wor

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"ROCKWELL" HARDNESS TESTER

?

When you reach for the phone you know the other fellow has a phone to

When you specify in "ROCKWELL" Tester readings you know the other fellow has one too.

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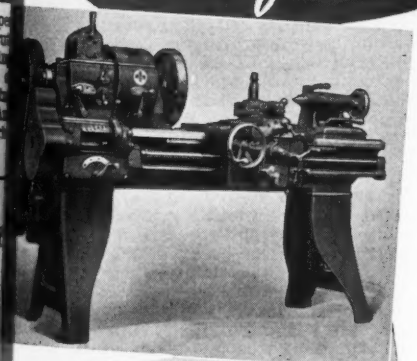
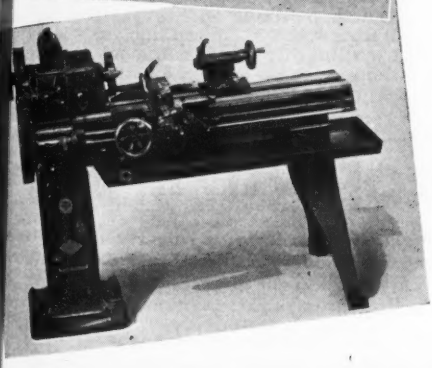
LE BLOND Regals



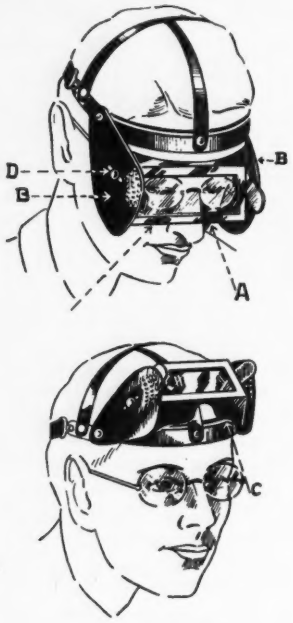


In the field of manufacture . . . there exists a popular demand for a lathe that will give precision performance on the many hundreds of turning jobs of industry . . . a lathe with all the essential qualities of design, construction and operation of the heavy duty lathes of industry—but made on a production schedule that makes low price possible. LeBlond Regals are this type of lathe. In all their basic fundamentals of dependable precision, operating ease and safety, rugged construction, modern design, Regal Lathes bear the indelible stamp of quality found in LeBlond Lathes of the heavy duty type. Only the low price gives evidence of LeBlond manufacturing skill which can make such high quality available at so low a price.

The new catalog of Regal Lathes provides complete details of the Regal Line of Lathes. Shows all features and complete specifications. Write for your copy.

THE R. K. LEBLOND MACHINE TOOL CO.
DEPT. N-9 CINCINNATI, OHIO

ing on gun, spot and flash welding, pouring metal and general grinding operations, has the lens frame and side protection shields of transparent non-inflammable material, affording maximum vision. A third model is designed particularly for the use of gas welders on



Jackson Eyeshield

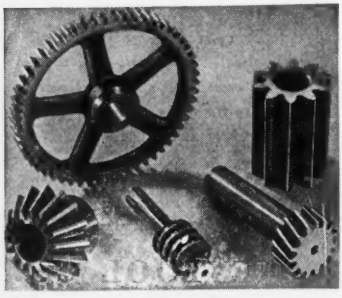
automobile body work and similar production operations and for gas welding inspectors and welders' helpers. The lens frame is cut away sufficiently on the under side to allow vision under the lens as well as through the lens, without adjusting the lens frame. This feature permits the wearer to walk around his work easily, pick up tools, and so on, without danger of accident.

Advantages claimed for the shields include wide vision, lightness, and no irritation of the nose bridge. The manufacturers—Jackson Electrode Holder Co., 6553 Woodward Ave., Detroit, Mich.—assert that experience has shown that workmen willingly wear these shields in the proper position, thus avoiding injuries that often result from improper adjustment of eye protection devices.

Smootharc "110" Welding Electrodes

The Harnischfeger Corporation, 4501 W. National Ave., Milwaukee, Wis., has added to its line of Smootharc Welding Electrodes the Smootharc "110"—an electrode developed for use in building up car wheels, rail ends and in flame hardening procedure. The base metal of the electrode contains approximately one per cent carbon, and the coating is designed to eliminate the brittleness common to high carbon deposits.

In addition to building up car wheels, worn rail ends, and so on, the arc stability of this electrode makes it suitable for the flame hardening of gears fabricated by the welding process. In such gears the rim splices are made by arc welding, and the weld metal, therefore, forms a part of the tooth sections. If the carbon content were not high enough, the metal would not respond to the flame hardening treatment. When no further treatment is given after welding, hardness will range from 20 to 40 Rockwell "C", depending on the rate of cooling. In drastic quenching operations, such as in flame hardening, values run as high as 62 Rockwell "C".



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Small and Medium Gears to your specifications
Systematic production planning assures accurate workmanship on large orders. Quantity *and* quality.

Send blueprints for estimates.

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DETROIT, MICH.—Walker Machinery Co.
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GAGSTONIA, N. C.—J. Maines

HOPKINS, MINN.—Charles Metcalf
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HOUSTON, TEXAS—Chickering Tool & Equipment Co., P. O. Box No. 2135.

INDIANAPOLIS, IND.—Geo. O. Desautels Co.
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LOS ANGELES, CAL.—Henes-Morgan Mach. Co.
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MILWAUKEE, WIS.—Dumser & Schroeder
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NEW ORLEANS, LA.—A. L. Kernion
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PHILADELPHIA, PA.—Jos. F. Sample
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PITTSBURGH, PA.—Jas. S. Murray
392 Hazel Drive, Mt. Leb.

RICHMOND, VA.—D. B. Packer
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661 Folsom St.

SEATTLE, WASH.—John H. Marvin Co.
1016 First Ave., S.

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317 North 11th St.

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WORCESTER, MASS.—Floyd H. Harris
66 Davidson Road

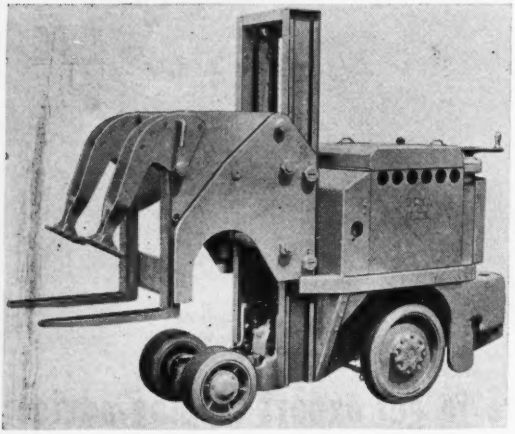
JOHN BATH & CO. ● WORCESTER, ● MASS.

Metal deposited by this electrode is not machinable. In operation, it works with the work negative and the electrode positive, laying beads of any desired width.

Smootharc "110" is available in sizes from 3-32 to 1-4 in. for currents ranging from 30 to 300 amperes, and is built in standard lengths of 14 inches.

Elwell-Parker Type F-10 Truck

The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland, Ohio, has placed on the market a truck of 5000-lb. capacity, designated as the Type F-10.



Elwell-Parker Type F-10 Truck

The truck has two-wheel drive and four-wheel steer, the steering being done by a hand wheel through gear reduction.

The trail axle is a single heavy formed bar pivoted at the center and permits compensating action in the event of rough runways or floors. Steering ar and rods are above the axle for grea road clearance and accessibility. T drive axle is equipped with an Elwe Parker 500 per cent overload, seri wound, four-pole, heavy duty and hi torque motor, which is direct-connect to the free coasting worm and ge Spur gearing may be supplied upon a plication. The truck has four spee forward and four reverse. The pow circuit is closed and broken by a mi type magnetic blow-out contactor.

The tin plate clamps on the F-10 tru are so designed that, as the forks a raised, the clamps automat cally lower and firmly hold t tin plate. When not require the clamps may be locked an upright position.

A solenoid brake on the ho motor locks the load in po tion unless released by the a plication of power. Regene tive braking supplements t solenoid brake and retur current to the battery wh lowering the load. A ratch protects the mechanism at t bottom of down-travel and a electric clutch protects t mechanism at the limit.

Yale Hand Lift Truck

According to the manuf turers—The Yale & To Mfg. Co., Philadelphia, Pa. the problem of quick and s handling of loaded tote pa is efficiently solved by t Yale Hand Lift Truck sho in the illustration. Outstanding fe tures of the truck include a count weight to prevent tipping, a tilted bac rest, and forks extending from the up rails. The forks are 10 in. long, and t capacity of the model shown in t

"OUTWEARS the best Bronze Metal"

20 years ARGUTO without a drink—K.A

ARGUTO OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

ARE YOU GETTING A HEAD ?

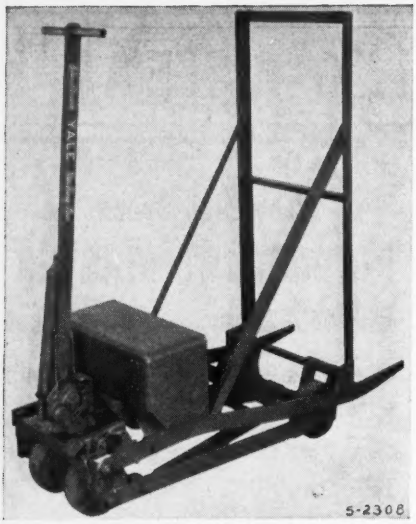
Investigate

The High Speed
BRIDGEPORT "MASTER"
Milling, Drilling and Boring Head

If you want a precision tool that can be depended upon to take care of the most accurate type of work—investigate the BRIDGEPORT "Master". It can be used for milling, drilling and boring **at all angles** without changing the setup of the work. The BRIDGEPORT "Master" has no limited field. It serves the one man tool shop or the largest automotive, electrical and machine tool industries with equal satisfaction.

Let us help you get a head. Write today.

BRIDGEPORT PATTERN & MODEL WORKS
52 REMER ST. ● BRIDGEPORT, CONN.



Yale Hand Lift Truck

illustration is 1000 pounds.

A pile of four or five tote pans can be straddled by the truck. The lifting frame is elevated, which raises the entire load and tilts it for safe riding. The truck is equipped with rubber-tired wheels and ball bearings.

"Fanite" and "Fanflux"

For the brazing of dissimilar metals or alloys, especially under conditions where the brazed joint is subject to heavy loads, a new alloy and flux are being marketed by Fansteel Metallurgical Corporation, North Chicago, Ill., under the trade names "Fanite" and "Fanflux". They are especially recommended by the manufacturer for the brazing tipped carbide or hard metal cutt tools.

In addition to unusual strength, Fa ite holds a plastic stage as it cools a time interval sufficient to allow contraction of dissimilar metals to rea a normal stage. Molten Fanite read follows irregular contours and spreads continuous film of uniform thickne over the surfaces in contact, which pr vents the formation of strain betwe the brazing metal and the united par

Fanite is intended for use in a co trolled atmosphere furnace at temper tures from 1950 to 2100 deg. F. It handled with exactly the same equip ment and technic as copper. Fanite available in standard strips 1½ in. wi by 8 in. long and 0.004 or 0.010 i thick. Special sizes are available order. The 0.004 in. metal is used as shim between the surfaces to be unite so that the brazing metal is in pla when it melts. The 0.010 in. metal used when it is desirable to flow t molten metal into the joint by capilla attraction.

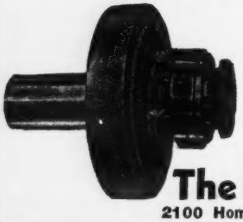
The companion flux is made in tw grades. Fanflux No. 3 is intended fo use with metals on which the braz flows or "wets" easily. Fanflux No. is for metals difficult to "wet". An in termediary flux can be obtained by mix ing the two grades.

Sterling Automatic Valve Control

Thousands of cubic feet of air a said to be wasted daily in plant throughout the country because opera tors of pneumatic tools neglect to sto their machines while changing opera tions. The Sterling Products Company 2457 Woodward Ave., Detroit, Mich have developed a unique automatic valv control for use on the Sterling Speed Bloc Sander. Without thought or effor on the part of the operator, this devic automatically starts and stops the sande

"EDGEMONT" SERVICE TESTED **FRICTION CLUTCHES**

DISC "TYPE SF"

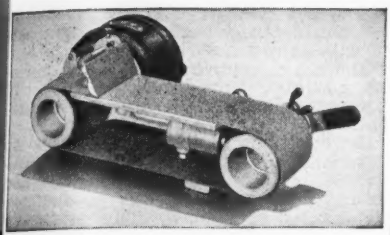


A dependable, trouble-free clutch, built for high standards of performance. Made in clutch pulleys, extended sleeves, and cut-off couplings. For machine applications, countershafts, and lineshafts the Edgemont "Type SF" Disc Clutch is outstanding for efficient service.

Write now for circular and data.

The Edgemont Machine Co.

2100 Home Avenue **Dayton, Ohio**



• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

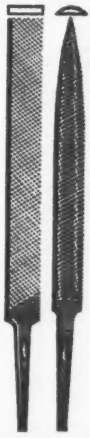
The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with **ALEMITE LUBRICATION** complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER
WALLS SALES CORP.
86 WARREN ST. NEW YORK, N. Y.

SPECIFY ALLIGATOR

TRADE MARK



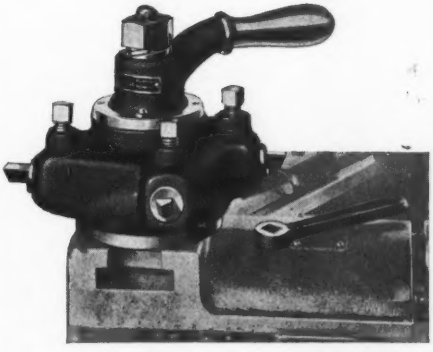
FILES . . .

Speed up production . . . the right file for the job will save time and money. Alligator Brand Files are available in a complete line of American and Swiss Patterns in all shapes, sizes and cuts to fit every filing need. Passing the highest tests, as to shapes, cutting quality and uniform hardness, they are guaranteed perfect in every detail. Write for catalog and prices.

CARSON-NEWTON CO.
61-71 MILL ST. • BELLVILLE, N. J.

Speed Up! McCrosky Turrets Can Help You

ON LATHE jobs requiring two or more successive operations McCrosky Turrets can SPEED UP your production. All tools mounted at one set-up before job is started. Each tool quickly indexed into operating position without stopping lathe. McCrosky Turrets in 6 styles with 3 or more sizes in each style. Ruggedly built for hard work and long life. To find style and size for your lathe send for BULLETIN 15-E.

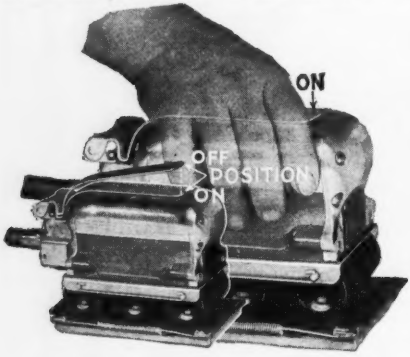


Style F McCrosky 4-Way Turret takes standard tool bits. Mounted in T-slot of compound. Made in 4 sizes.

McCrosky Tool Corporation, Meadville, Pa.

and controls the flow of water when the hose is attached for wet sanding.

Low air consumption is one of the outstanding features of the control. It



Sterling Automatic Valve Control

is claimed that the use of bar stock, aluminum pistons and expander rings mounted behind the piston cups in the latest model reduced air consumption to approximately 5½ cu. ft. per minute under full load at speeds of 3000 oscillations per minute. Tests conducted by the manufacturer indicate that air was used will approximate 15 to 35 per cent of the air consumed in the operation of the machine. This waste is said to be eliminated through the use of the automatic valve control.

In addition, operating efficiency is materially increased by providing freedom of both hands to operate the machine and manipulate the product being sanded or rubbed. This feature is particularly desirable on gas sanding and rubbing applications which necessitate freedom of workmen's hands for applying compounds, gasoline, benzine, and so on.

The control is designed to fit all models of Sterling sanders and is quickly installed by simply removing the hand operated air and water cams. The same holes that held the cams are used to install the automatic control.

"First Aid" Kits of

WALTON TAP EXTRACTORS

ARE A SHOP NECESSITY WHEREVER TAPS ARE USED

They remove taps broken at or below the surface of the hole easily, quickly and without injury to the threads.

Send for Folder 132 giving sizes, styles and prices.

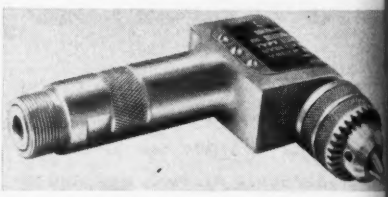
Test their worth by 30-day Free Trial.

The Walton Co.
98 ALLYN STREET
HARTFORD, CONN.

Stow Series 420 Close Corner Angle Head

The illustration shows the Series 420 Close Corner Angle Head which has been designed by Stow Manufacturing Co., Inc., Binghamton, N. Y., for use with a flexible shaft for drilling and filing in close quarters.

The head is equipped with miter gears and ball thrust bearings and is recommended for use with 1A, 2A or 3A flexible shafts. The device is furnished with a ¼-in. capacity chuck for drills, rotary files, rasps, mounted wheels, and so on.



Stow Series 420 Close Corner Angle Head

Nielsen Transfer Screw

Transfer screws for transferring holes accurately and conveniently are now being made by Nielsen Tool & Die Company, Berkley, Mich. The heads of the transfer screws are all of uniform height regardless of thread size, and the center and drill circle are swung into the steel from 0.010 to 0.015 in. Nielsen Transfer Screws are case hardened and, to take

Improved Anderson

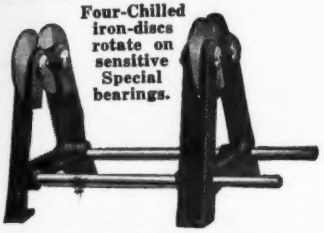
Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



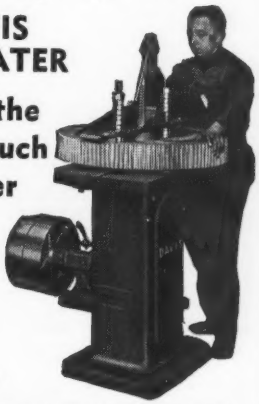
Four-Chilled iron-discs rotate on sensitive Special bearings.

Write for Full Information

Made by **Anderson Bros. Mfg. Co.**

1926 Kishwaukee St., Rockford, Ill.

Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER will do the job so much quicker and better?



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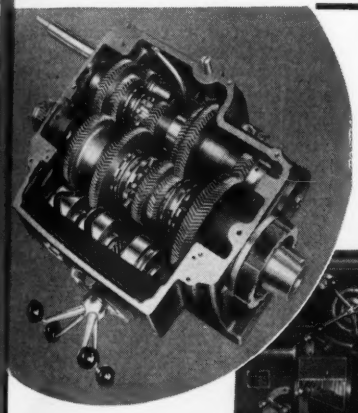
DAVIS KEYSEATER CO.

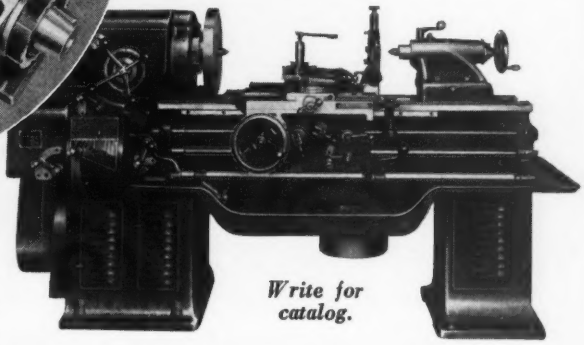
Exchange & Glasgow Sts.

ROCHESTER, N. Y.



All-Herringbone Transmission Only in SIDNEY Lathes

An all-herringbone transmission, composed of 12 continuous-tooth gears, completely eliminates all gear tooth or tool marks from the work. Controlled by Monotrol (1 dial) or Tritol (3 levers). Sizes 14" to 24".



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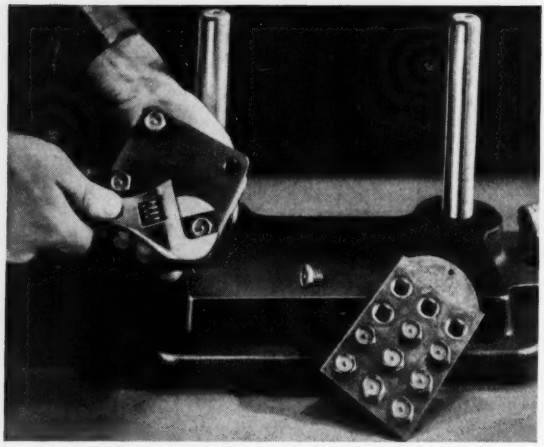
THE SIDNEY MACHINE TOOL CO.

210 HIGHLAND AVE.

SIDNEY • OHIO



Nielsen Transfer Screw

care of eventual shrinkage of screw holes, are manufactured 0.005 in. under standard pitch diameter.

By inserting the screw into the hole to be transferred and striking the section a solid blow, the user will obtain the center and drill circle. The transfer screw can easily be inserted into a blind hole with an adjustable wrench or pair of pliers. Inasmuch as the heads of Nielsen Transfer Screws are of uniform height, regardless of thread size, different sizes of holes in the same plane can be transferred at the same time. The screw is available in sizes of ¼, 5/16, ⅜, ½, ⅝ and ¾ inch.

Houghton "60" Series

E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., announces a series of soluble cutting oils called the "60" Series and inclu Hocut 60, Metcut 60 Permasol 60.

The chief features these oils are said to (1) permanence in solu —will not break down under boiling conditi (2) rust preventatives h been added; (3) self-em sifying, mix immediately cold solutions and may used at once; (4) lubricants and coolan lengthen tool life; (5) f dom from gumming; rapid wetting out ag have been added, the speeding up production; antiseptically treated; economical, mix to tremely dilute soluti and (9) contain no vola materials to evaporate.

Norton Diamond Wh

As a result of extensive research w Norton Company, Worcester, Mass., developed a new type of diamond w which embodies the use of a meta bond. In this wheel the diamonds actually imbedded in solid metal, entire rim being one homogeneous pi This construction eliminates any j between the diamond-impregna grinding surface and the balance of rim that might cause premature bre ing away of the expensive abrasive m terial. In some styles, such as th used for cut-off operations, the en wheel is one piece of metal.

The metal used is a special alloy t holds the diamond particles securely, allows just enough wear to keep wheel free-cutting. Preliminary tests the laboratories and the field are s to indicate that the diamonds are l longer, the corners of the wheel sta

GREENERD

Arbor Presses

500 lbs. to 35 tons pressure

HYDRAULIC, MOTOR DRIVEN, HAND OPERATED

Greenerd Arbor Press Co. Nashua, N. H

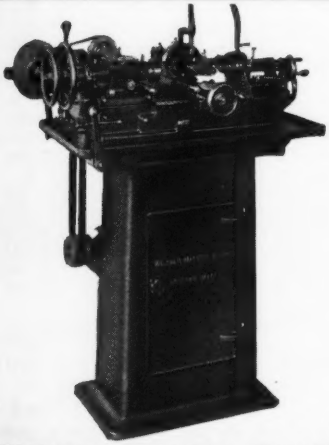
NEAT STAMPING in NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

Write for Particulars

GEO. T. SCHMIDT, Inc.

1806 Belle Plaine Ave., Chicago, Ill.



WALTHAM THREAD MILLER

Can be furnished with a variety of equipments for tool room or manufacturing purposes. Write us for particulars.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

SURE, STEAM HAMMERS WILL CRACK NUTS

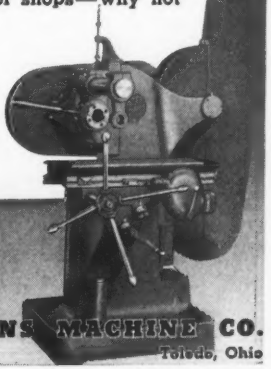
A skilled hammerman can crack a walnut—without smashing it—on a giant steam hammer. But no one would make a business of cracking walnuts on a steam hammer.

Use of elaborate, heavy, high priced milling machines for production work is similarly uneconomical. It can be done, but it costs too much.

The Kent-Owens Miller is a production tool—stripped for action. Speed in operation—set up—loading and unloading—enables it to reduce machining costs.

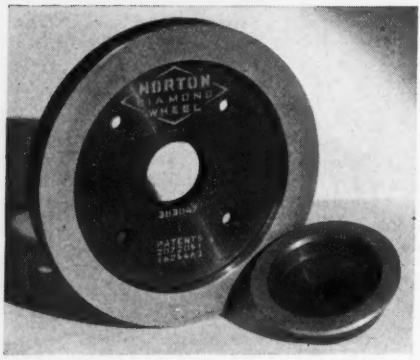
They are saving money in hundreds of shops—why not in yours?

Write for more information.



KENT OWENS

KENT-OWENS MACHINE CO.
958 Wall Street Toledo, Ohio



Norton Diamond Wheel

up better, and the wheel is not damaged by the heat of grinding and is less subject to accidental injury.

The manufacturer states that it is not expected that this wheel will supplant the Norton Diamond Wheels now on the market but that it will effectively supplement them, making possible a broader range of economical use for diamond wheels.

Williams Improved Carbon Steel Wrenches

An improved type of carbon steel wrench is being supplied by J. H. Williams & Co., 75 Spring St., New York,

Williams Improved Carbon Steel Wrench

N. Y., in a complete standard line consisting of 50 patterns and more than 1000 sizes. The wrenches are said to approximately twice as strong as fashioned carbon steel wrenches average 93 per cent as strong as steel wrenches of similar size.

The unusual strength characteristic the wrenches result from the fact they are drop-forged from impr quality carbon steel and specially cessed to the exacting specifications the manufacturer. Other advant claimed include better hand grip greater and safer bearing on the nut

J. H. Williams & Co., recommend carbon wrenches for most indus uses and their chrome-molybde wrenches for automotive and other poses where operation in close quar is required, where higher polishing crome-plating is desired, or where extra 7 per cent of strength is essen

Udylite Masterfold Buff

The Udylite Company, 1651 E. Gr Blvd., Detroit, Mich., announces "Masterfold" Buff. It is claimed this buff will give from 25 to 75 cent greater buffing performance, formance being measured in terms fast cutting, long buff life and proved finish.

The manufacturer states that the is constructed on an entirely new, cally different principle. The cloth folded in such a manner to accomp two main objects—to present a mult of cloth edges that cut instead of and to provide air spaces between cloth ply to dissipate friction heat erated by pressure of the buff on work.

The Masterfold is said to be an ceptionally fast cutting buff. It lite ly bites into the metal with a minim of pressure. Composition is held pocketed so that the efficiency of operation is maintained with fewer

HEAVY AUTOM DUTY

Continuous Hinge No. 290

A HEAVY HING
FOR HEAVY DUT
Stocked in 7
lengths, 3" and 5
wide when open.
Special lengths an
widths to order.
For details write:
AUTO MOULDIN
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CHICAGO

CLEMENTS CADILLAC

Portable Electric

BLOWERS

and Suction Cleaners

This Portable Electric Blower is instantly convertible to a Suction Cleaner. Innumerable cleaning tasks are made easy because of its versatility, efficiency and safe method of cleaning. Plugs in any light socket—no expensive installation needed.

CLEMENTS MFG. CO.

6650 So. Narragansett Ave.

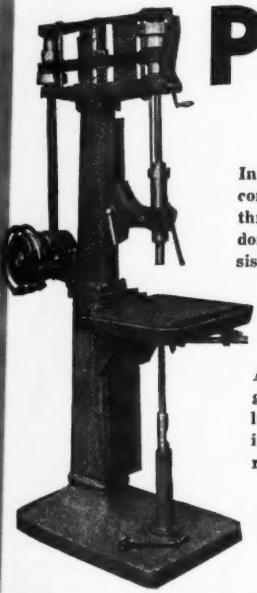
CHICAGO ILLINOIS

Champion Steel Racks

Write for Specifications and Prices

WESTERN TOOL & MFG. CO.

SPRINGFIELD, OHIO



PRECISION DRILLS

FOR PRECISION PRODUCTION

In PROVIDENCE PRECISION DRILLS you will find that ideal combination of qualities which makes for extreme accuracy throughout a long life of service—speed, power, rigidity, freedom from vibration, sensitiveness, rugged strength, wear-resistance—AT MINIMUM COST PER HOLE.

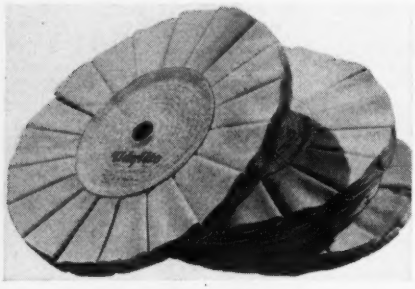
BALL BEARING THROUGHOUT

At every rotating point in the PROVIDENCE DRILL, high-grade ball bearings are employed—to save power, simplify lubrication, increase sensitiveness, eliminate looseness. There is a PROVIDENCE PRECISION DRILL to meet your requirements. Write for the Bulletin.

Providence Engineering Works, Inc.

523 SO. MAIN ST. PROVIDENCE, R. I.

plications to the wheel. It will not burn as the "open face" construction permits free air circulation which dissipates heat generated by friction between the wheel and the work. More-



Udylite Masterfold Buff.

over, the Masterfold wears down evenly.

The buffing action is said to be uniform over the entire face of the wheel and ridging, pitting and chattering are eliminated. Masterfold Buffs are produced in a variety of types according to the density and treatment of the cloth. All standard diameter and hole sizes can be furnished.

Bonney Roller Cabinet

Bonney Forge & Tool Works, Allentown, Pa., has announced the addition of a line of roller cabinets to its line for mechanics. Made of heavy gauge sheet metal with a durable, attractive tan "crackle" finish, the cabinets are said to be especially convenient for the mechanic who services the modern automobile, industrial machinery, tractors, trucks, buses, and so on.

The cabinets, which are available in single and double door models, have chromium trim, tumbler lock, rounded edges and inside shelf. They are mounted on noiseless, rubber-tired casters for ease and convenience in moving about the shop.

The No. "C" Roller Cabinet, single door model, is 24 in. long, 12 in. wide, 27 in. high and, without tools or metal box for tools, weighs 40 lbs. The size of the cabinet is of the correct size

No. "CC" Roller Cabinet with No. "A" Bonney Tool Set

accommodate the No. "MC" Bonney piece socket and wrench set or the "BB" Bonney 72-piece tool set.

The double door No. "CC" Roller Cabinet is 28 in. long, 13 in. wide and in. high. Without tools or a metal

HIGH SPEED *Shears*

For Cutting Irregular Shapes from Sheet Metal.

Most all requirements for such work — standard equipment furnished for ring and circle cutting . . . absolutely accurate and easily operated . . . metal is sheared and not punched.
Cut anywhere, no starting holes required for inside cutting . . . only one adjustment for various thicknesses of materials used . . . unobstructed cutting vision . . . no further finishing required. No special cutters, pilots, templates, or strippers are needed . . . long life shear blades. Write for complete information.

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SMALL GEARS

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High precision or commercial production. A few pieces or a million.

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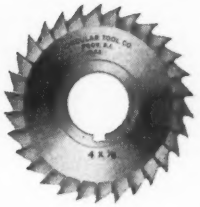
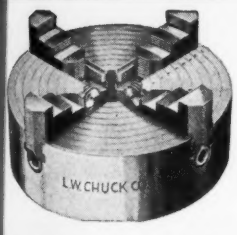
Specify CIRCLE "R" Saws

R
TRADE-MARK



CIRCLE "R" products are made in both high speed and carbon steel, from ¼" to 10" diameter. Prompt delivery on all standard or special saws. Write for catalog.

CIRCULAR TOOL CO., Inc.
767 ALLENS AVENUE • PROVIDENCE, R. I.
CHICAGO DETROIT INDIANAPOLIS
NEW YORK CLEVELAND PHILADELPHIA



OUTSTANDING TOOL VALUES

4-Jaw Independent Lathe Chucks

NOW MADE IN 5 SIZES

10-inch	$29.00
12-inch	33.50
14-inch	38.00
16-inch	47.00
18-inch	62.75

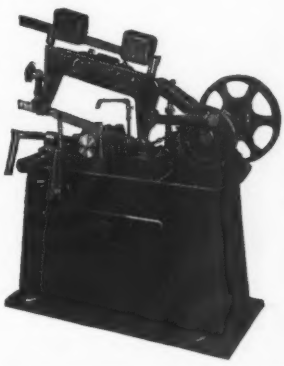
L-W lathe chucks are built with semi-steel construction and heavily ribbed body to withstand unusual strains. Four independent jaws made of accurately ground and fitted hardened steel are reversible and have 1¼" tough nickel steel screws. Best material and workmanship guarantee satisfactory service.

High Speed 6x6 POWER SAW

Designed for maximum rigidity, this saw is accurate and efficient in operation. Automatic trip stops the machine on completion of the cut. Automatic relief of the saw blade on the non-cutting stroke is also provided. To make a clean and compact assembly, the coolant pump is mounted inside the base. Capacity is 6"x6", with 10"x14" blades. L-W also manufactures magnetic chucks, demagnetizers, dividing heads, and milling machine vises. Write for our complete catalogue.

$160

Motor Drive Arrangement $22.50 Additional

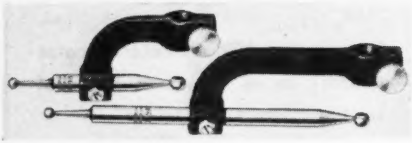


L-W CHUCK CO.
20 N. St. Clair St. Toledo, Ohio

for tools it weighs 50 lbs. The top of the cabinet will accommodate the No. "AA" Bonney 87-piece socket and wrench set or the No. "AA1" Bonney 140-piece complete tool set which includes practically every standard type of hand tool required for service work. The cabinets may be purchased without tools and metal box to accommodate present tool equipment, or with empty metal box to match the cabinet, or complete as illustrated.

B & S Hole Attachments

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced two hole



B & S Hole Attachments

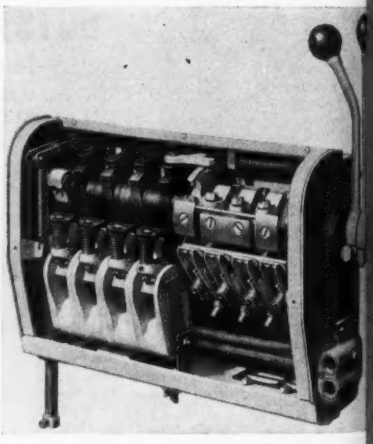
attachments designated as Nos. 729A and 729B. The attachments are said to increase the usefulness of a dial test indicator, adapting the indicator for testing internal and other surfaces w can not be reached with the spindl the dial gage. They are easily and qu ly attached to the dial gage and firmly in position by a knurled cl screw. A desirable feature is the justable fulcrum screw by which l ness or play in the arm can be e inated.

Hole Attachment No. 729A is part larly suited for use in deep holes depth of 1-11/16 in. Hole At.achm No. 729B is especially adapted for in short shallow holes or for ro grinding or boring operations, bec with the short arm the tendency chatter is reduced. The No. 729B enter a hole to a depth of 13/16 i

Yale Cam-O-Tactor Controll

Engineers of The Yale & Towne M ufacturing Co., Philadelphia Divi Philadelphia, Pa., have developed w is said to be an entirely different c operated contactor controller. It is c the Cam-O-Tactor, and will be stand equipment on Yale electric trucks.

With this controller it is possibl effect the make and break contacts w out creating the usual sticking or w ing of electrical surfaces so often ca by arcing, even when there is extr



Yale Cam-O-Tactor Controller

vibration or great fluctuation of volt The Yale Cam-O-Tactor combines high current interruption capacities long life of contactors with the posi action and safety of mechanical c

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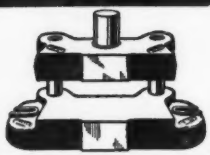

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DIE SETS

Machined Steel — Semi-Steel

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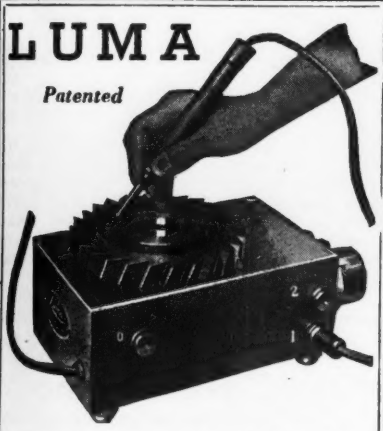
Patented



Combination Demagnetizer and Electric Etching Pencil. Marks symbols in hardest steel. Demagnetizes instantly. One of our models popular in tool rooms for 15 years.

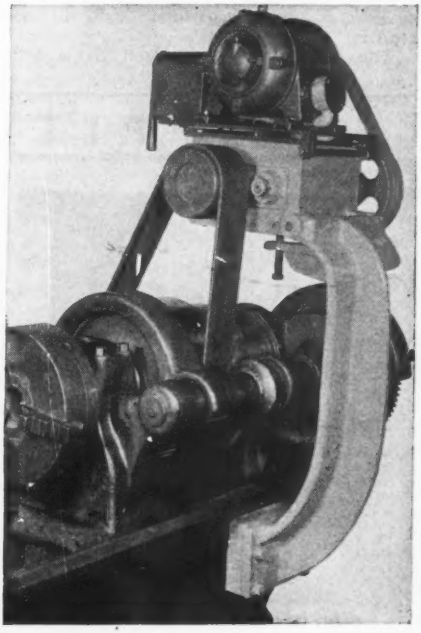
Luma Electric Equipment Co.

DEPT. MS — TOLEDO, OHIO

NEW TYPE 1136 DIRECT MOTOR DRIVE

with

4-SPEED QUICK-CHANGE GEAR BOX



FEATURES:—

Quick, easy speed change through 4-speed gear box . . . no belt shifting, no cone pulley . . . gives 8 speeds when a 2-speed motor is used . . . gives your machines greater range and efficiency . . . mounts above or at side of machine . . . 4 types of drives.

Write for Bulletin.

The Production Equipment Co.

CLEVELAND, OHIO

operation, and is said to increase electric truck efficiency.

Willey's Carbide-Tipped Drill

A carbide-tipped drill for use in drilling holes in non-metallic materials such as concrete, tile, brick, slate, plaster, limestone, marble, glass, carbon, and so on, has been placed on the market by Willey's Carbide Tool Company, 1340 W. Vernor Highway, Detroit, Mich. The drill is recommended by the manufacturer to maintenance engineers in installing machines.

The tool can be operated in a drill press, electric drill or hand brace at r.p.m., no coolant being necessary. W the hardness of the tip of the drill proaches that of diamonds, the drill

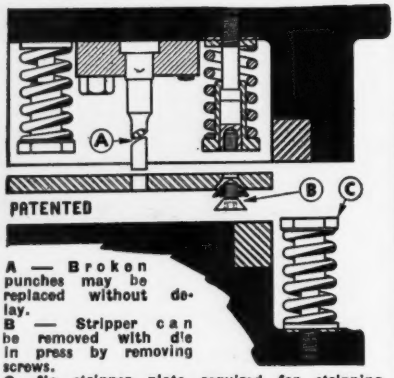
Willey's Carbide-Tipped Drill

be sharpened on any type of grin and any make of grinding wheel.

The tool is available in 12 sizes, ra ing in drill diameters from ⅛ to 2 Overall length ranges from 2½ to inches.

STRIPPIT

The most dependable and economical stripping device made.



A — Broken punches may be replaced without delay.
B — Stripper can be removed with die in press by removing screws.
C—No stripper plate required for stripping scrap—strippits alone will strip it.

Write for catalog.

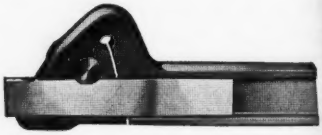
THE STRIPPIT CORPORATION

1559 Niagara St. Buffalo, N. Y.

Also Wales hole-punching and notching dies.

Williams Spring Cutting-Off To Holder

Williams Cutting-Off Tool Holder product of J. H. Williams & Co., Spring St., New York, N. Y.—are n available in two types. A new hold embodying the spring principle, has be



Williams Spring Cutting-Off Tool Holder

developed for conditions where the u of such a tool will produce the mo satisfactory results. Due to the goos neck design of the holder, the cutt blade is relieved of excess pressure. Cha tering and "climbing" of the work the tool, particularly on old or "loos lathes, is said to be eliminated.

STAMP...STAMP...STAMP the "THORS" are marking

THOR Stamps give clear, uniform marks—for a long time. More marks per dollar.

Made of special, correctly-heated alloy steel. Central striking point gives uniform indentation. Thumb side marking makes them easily read—easily used. Write for catalog.

THE PITTSBURGH STAMP CO., 812 Canal St., Pittsburgh, Pa.

TAKE THE DUST OUT OF INDUSTRY

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TORNADO Portable Electric Blower

The Most Powerful Portable Blower Ever Built—Blows Dry Air at 275 M. P. H.

One small machine and attachments with tremendous power of blowing or suction—46¼" waterlift—completely removes dust and dirt from motors and machinery. Prevents overheating, excessive friction motor burnouts. Far superior to compressed air, and costs much less. Also sprays insecticides. Really an industrial maintenance machine of a hundred uses.

Let us show you how cleaning can be done better and at less cost. No obligation—write!

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FREE TRIAL!
We'll gladly send you a Tornado for free trial to prove our claims. For prices and details of free trial offer, write.

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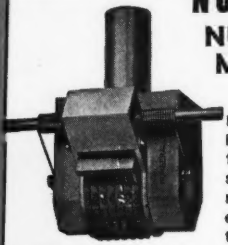
NUMBERING MACHINES



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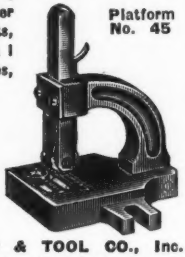
Name plates, steel and other metal parts, tools, metal checks, badges, etc.

Write for latest literature and prices.



Platform No. 45

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Huguenot Park, Staten Island, N. Y.

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Just think of this — a really efficient continuous filing machine at a sensationally low price! For faster, better, smoother work on all metals, alloys, plastics, fiber, wood, etc.

The file segments automatically interlock and form a rigid file before they reach the work. Filing is in one direction only, prolonging file life and producing an exceptional job.

13 standard file bands are available for best work on various materials, from toughest high carbon steel to copper, brass, etc.

See how the File Band works

It's Sturdy. Weighs 150 pounds. Portable. Place on any work bench.

32" high. Operated by any ¼ H.P. motor (not included).

Every machine shop, model and tool room and metal worker can save time and money with this remarkable performance machine. Get a demonstration from your Dealer or order on 10-Days Free Trial. Circular on request.

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1306 S. Washington Ave. Minneapolis, Minn.

MMS-7

☐ Send Continental Filer on 10-Days Trial.
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Name .....

Address .....

Both the new Spring and the older Rigid types of Williams Cutting-Off Holders feature a positive cam cutter lock. A full-bodied cam grips the accurately - machined high speed cutter blade in such a manner that pressure of work against the blade tends only to tighten the blade in the holder.

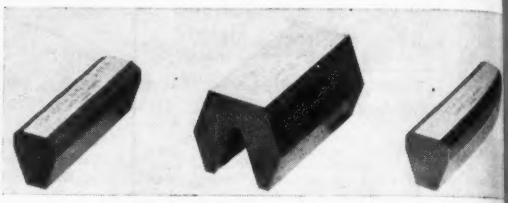
The Spring Cutting-Off Holders are supplied in both straight and right hand offset patterns in four sizes.

Gear Measuring Blocks

The Illinois Tool Works, 2501 North Keeler Avenue, Chicago, Ill., announces a new development—the Gear Measuring Blocks illustrated herewith. Used in conjunction with micrometers, the blocks provide a simple and accurate means of checking the pitch diameter and tooth thickness of spur or helical gears of either involute or stub tooth systems.

Each set consists of three blocks, two males and one female, and is constructed for a specific pitch and pressure angle.

Two male blocks are used for gears wi an even number of teeth, and the co bination of one female and one male f gears with an odd number of tee



Illinois Gear Measuring Blocks

Readings are said to be reliable becau the blocks check while contacting o certain part of the involute; the li of action. Therefore they always che the true pitch line condition of thick ness and space, variations in the for of the involute do not affect the readin

Measurements are quickly made wit a minimum number of moves on th part of the operator. The mathematic formula used is simple and easily unde stood. If the micrometer anvils are seate squarely on the flat top surface of th blocks, all the requirements for an accu rate reading are fulfilled.

Standardized JIG BUSHINGS
Acme Standard over 6700 Items
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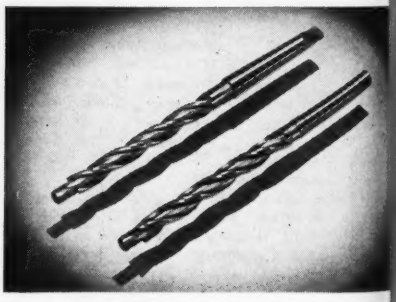
Acme Drill Jig Bushings are made by the most exacting, scientific methods —insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

ACME INDUSTRIAL COMPANY
212 N. Laflin St., Chicago, Ill.

Putnam Hi-Speed Continuous-Pilot Counterbore

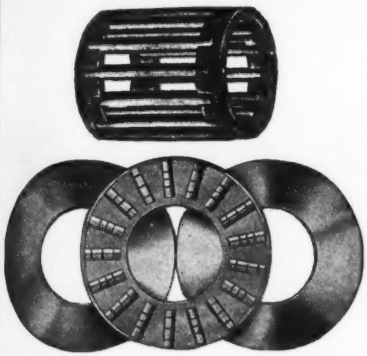
The Putnam Tool Company, 29 Charlevoix Ave., Detroit, Mich., has introduced a counterbore in which th



Putnam Hi-Speed Continuous-Pilot Counterbo

pilot is continuous through the entire fluted portion of the tool. The device is to be known as the Putnam Hi-Speed Continuous-Pilot Counterbore.

The purpose of the counterbore is to utilize almost the entire length of the



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2-point gaging
to ½ of 1/10,000"
with self-aligning

COMTORPLUG

Automatically finds true diameter. Shows taper, out-of-round, barrel shape.

This unique patented gage is steadily winning new users among makers of airplane and auto engines, electrical equipment, precision machinery. Regular operators get same results as experts, due to automatic features.

Bulletin 25 upon request.

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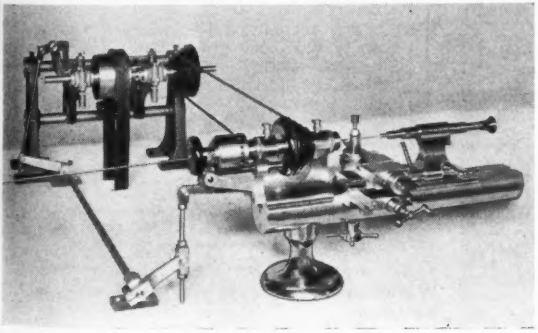
Est. 1928 Waltham, Mass.

DERBYSHIRE WATCHMAKERS LATHES

W. W. Large Magnus — Length of Bed 12 inches; Center Height 5 cm or 1.97 inches; Swing 10 cm or 3.94 inches

THROUGH CAPACITY

W. W. : 5 mm or .197 inches
Large : 6.35 mm or .250 inches (¼")
Magnus: 8 mm or .3125 inches (5/16")



DERBYSHIRE LARGE SPRING BIND LATHE

DERBYSHIRE ELECT LATHE:

Length of Bed 15 inches with 1 Pedestal

Length of Bed 18 inches with 2 Pedestals

Center Height 6 cm or 2.36 inches

Swing 12 cm or 4.724 inches

Through capacity 8 mm or .3125 inches (5/16")

SEND FOR OUR NEW CIRCULAR

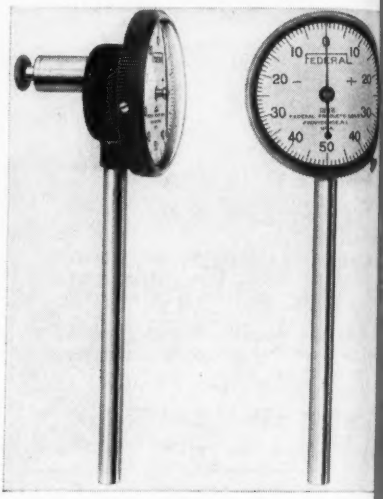
F. W. DERBYSHIRE, INC. WALTHAM, MASSACHUSETTS, U. S. A.

flutes before it becomes necessary to discard the tool. When the pilot head becomes too long, as a result of wearing of the cutter flutes, it is cut off. The cutter flutes are ground back to the length of a pilot head, and a new, perfect pilot head is exposed. This operation may be repeated as many as six times, each change in length producing a counterbore that is as efficient in every way as the original tool.

The counterbore is made of high speed steel, is heat treated by the salt bath process, and is guaranteed by the manufacturer for perfect performance.

Federal V-8-I Indicator

The illustration shows the Fede V-8-I Indicator now being marketed Federal Products Corporation, 1144 E St., Providence, R. I. The indicator



Federal V-8-I Indicator

of the perpendicular spindle type; t is, the contact point is perpendicular the face of the dial, which permits indicator to be used in positions wh the regular type of indicator is readily adaptable. This indicator sup sedes the former Federal Model Junior.

One of the principal advantages the V-8-I instrument is that a cr gear is used in place of the previ spiral to change the direction of gear movement. This construction

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STRAIGHT · CYLINDRICAL
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All Kinds of Materials

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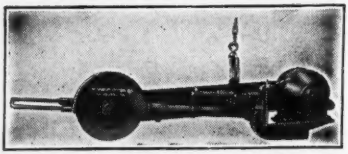
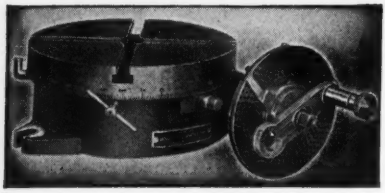
MUMMERT-DIXON SWING FRAME GRINDERS



Sizes 14", 16", 18", 20" and 24" wheels
ASK FOR DESCRIPTIVE CIRCULAR
MUMMERT-DIXON CO.
120 Philadelphia St. Hanover, Pa.



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Send for circular.

STEVENS ROTARY TABL
DIAL INDEXING TYPE

Table graduated for single degree readin Worm can be disengaged for turning tab by hand.

Other sizes 12", 18" and 24" diameters.

JOHN B. STEVENS INC.
306 HUDSON ST. NEW YORK, N.

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COMET Vernier Caliper

$5.50

with genuine leather pocket case.

WHY PAY MORE?

Send for one today!

Shop agents, dealers wanted.

Measures to .001" Outside, Inside and Depth

Measuring range 5-5/16".
Total length 8".
Scales: 1/16" with vernier 1/128".
.025" with vernier 1/1000".
Decimal equivalents on reverse side of gage.
Glass-hard jaws.
Fine workmanship.
A precision tool at a reasonable price.

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39 Union Square, New York, N. Y.

For ALL Wheel Dressing Operations

The new EVER-SHARP DIAMOND TOOL is made with a long, natural shaped diamond—requires no resetting—is adapted to ALL types of wheel dressing operations—economical—accurate.

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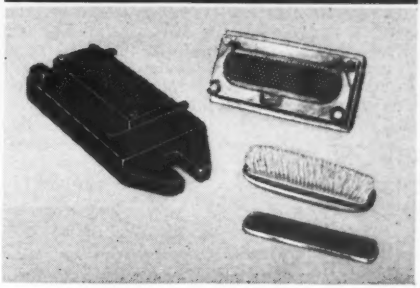
$1.00 Worth of CERROMATRIX Saved 100 Hours on This Die



MR. GEORGE SCHADER, of R. H. Brown & Co., New Haven, Conn., reports a saving of more than 100 hours by using CERROMATRIX in the piercing die shown above.

And this is only one of many cases where small amounts of CERROMATRIX used for securing punch and die parts have made outstanding savings in producing metal-working dies for long as well as short runs on metals up to 5/32" thick. These dies are used by some of the largest manufacturers in the country.

Also CERROBEND for tube bending and CERROBASE for reproducing master patterns accurately at low cost. Other low-temperature-melting alloys for special applications upon specification.

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44 Wall Street, New York, N. Y.

British Associates: Mining & Chemical Products, Ltd., London, England

sults in a much more sensitive and more accurate indicator, and eliminates friction caused by the spiral.

The indicator is also equipped with an oilite bushing in the ⅜-in. diameter size stem. This bushing is used in Federal indicators because its further aids in the elimination of friction and results in smooth operation. The oilite bushing is a development of the self-lubricating bronze type of bushing. The lubricating feature can be closely limited to the requirements, thus avoiding some of the over-lubrication which is detrimental to the efficiency and accuracy of an indicator.

For Machine and Tool Work and Quick Set-Ups

use Reich's, the only 3 way reading precision Indicator. Contact point mounted in centered cone bearings. .014 reading. Order direct or through your dealer.

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DO IT NOW!

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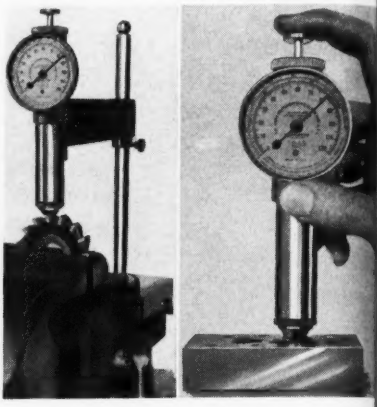
Shore Pocket Scleroscope

To fill the need for an inexpens pocket-size hardness tester, the Sh Instrument & Mfg. Co., Jamaica, L



Shore Pocket Scleroscope

Island, N. Y., has brought out the poc scleroscope illustrated. The instrum is said to be of rugged construction a designed for simple operation. To ma a test, the instrument is placed on t of the piece to be tested, a small st button on the top of the barrel pressed down gently and then allow to return. This simple action comple the test. The indicating mechanism entirely automatic and the pointer r mains fixed at the indicated hardn number until the next test is ma Sixty or more tests per minute can made. It is said that there is no str on the eye and the pressure required the operating button is comparable w

SEVERANCE MIDGET MILLING CUTTERS Large stock of Standard cutters. Any shape any size—custom made for burring, countersinking, taper-reaming, tube burring and facing, ball socket reaming, trepanning, etc. Submit your problem to our engineers. **CATALOGUE ON REQUEST.**

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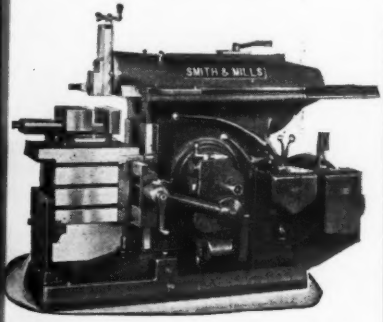
EFFICIENCY MEN TAKE NOTE

Give your men a lift with this Modern method of moving heavy tools or parts.
This table can swivel and be locked to any position, can be varied 15½ inches by a slight pressure of the foot, leaving the operator's hands free.
No grouping of three or four men to lift and struggle with heavy parts. The modern way of moving heavy parts to different levels.
These tables are built by tool engineers who have long designed and produced special machines, dies, jigs and fixtures to exact specifications.
No inquiries too small, no orders too large to receive our usual prompt attention.

Write for our illustrated catalog No. 2.

Midwest Tool & Eng. Co.
112 Webster Street Dayton, Ohio

SMITH & MILLS SHAPERS



Automatic lubrication — forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

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FLAT—ROUND IRREGULAR SURFACES BY ROLLING OPERATION

MODEL 25
HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILL.

that required to operate a typewriter key.

Master Disc Grinder

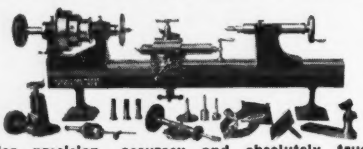
The illustration shows a disc grinding machine now being built in 18, 20 and 24-in. sizes by the Kindt-Collins Company, 12695 Elmwood Ave., Cleveland, Ohio. The grinder is especially intended for pattern making, tool and die making and similar work. The machine is of sturdy construction. The main bearings and shaft are capable of withstanding a radial thrust of more than 7,000 lbs. The tables are heavily ribbed, heat treated, and ground. They can qu and accurately be adjusted to any by means of a worm and gear of

Master Disc Grinder

but accurate design. Fine, accu readings are obtained by means protractor with a long radius, whic engraved on the machine. The table be tilted downward to 45 deg. and ward to 25 degrees.

Ball bearing motors of 1½ and 2 for the 18-in. and 24-in. grinders spectively provide power which is tr mitted through heavy multiple V- to the main shaft and dust fan.

ELGIN Precision Bench Lathe



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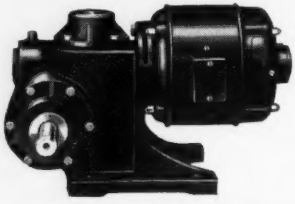

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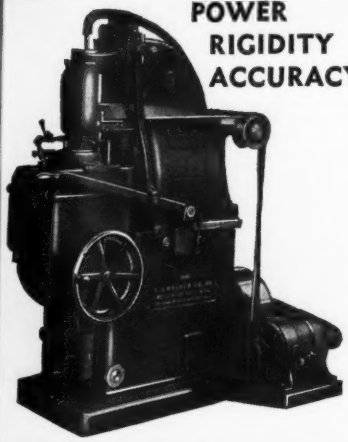

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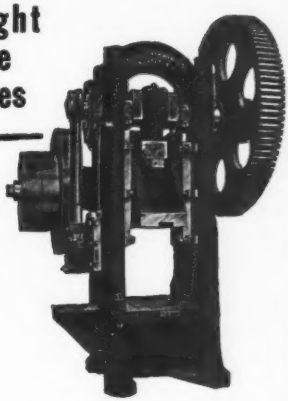

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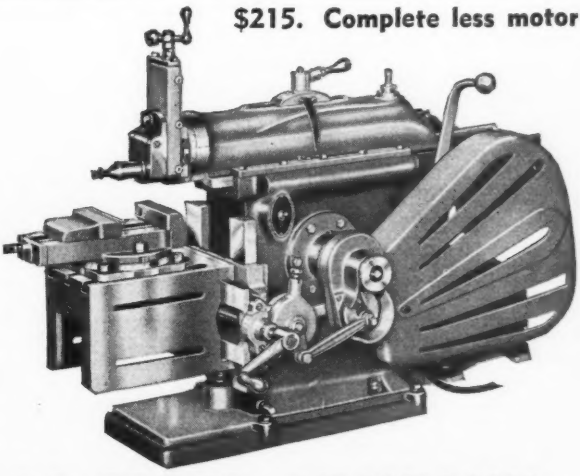
$215. Complete less motor



Handling the full range of shaping operations up to 7", this new Atlas Shaper provides an easy way to cut costs in tool room and shop. Drive is standard bull-gear type powered completely by V-belts—4 speeds, 5 feeds—requires but ½ H.P. motor. Write for complete details.

ATLAS PRESS COMPANY
746 N. PITCHER ST. KALAMAZOO, MICH.

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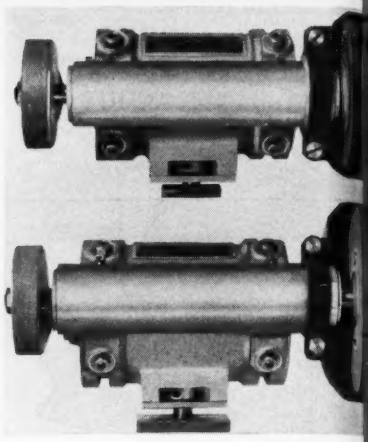
motors are mounted on felt in the base of the machine. Discs are machined from hot rolled boiler steel, heat treated and ground to balance. All parts are balanced and there is no vibration, even under load. A shielded light is provided which is controlled by the starting switch. The standard motor can be either 110-220 or 220-440 volt, 60 cycle, single or three-phase, 1,725 r.p.m. The dust system consists of a large sized, positive acting, ball bearing suction fan driven by multiple V-belts. Dust is deposited on the floor or in a container as desired.

Themac J-30 and J-40 Portable Tool Post Grinders

The McGonegal Manufacturing Company, Jones Bldg., East Rutherford, N. J., is now marketing two improved models of the Themac Portable Tool Post Grinder, both of which are shown in the illustration. The J-30 is an improvement over the Type J-3, due to the fact that it handles a 4-in. wheel in place of the 3-in. wheel formerly used and also to the fact that a new type Themac Pencil Wheel can be attached directly to the end of the spindle for internal grinding. The J-30 grinder is equipped with a 1/3 h.p. universal motor which operates on A.C. of 25-60 cycle and D.C. the same voltage.



(Above) Themac Type J-30 Portable Tool Grinder. (Below) Themac Type J-40 Portable Tool Post Grinder

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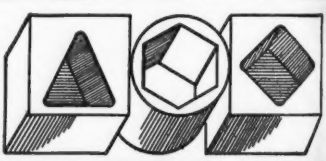
Varick Machine & Tool Works, Inc.
306 Hudson St. New York City



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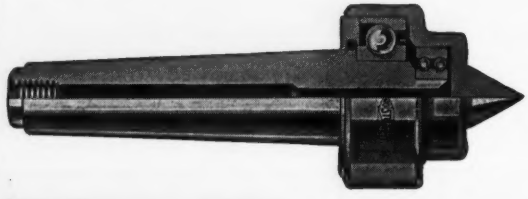

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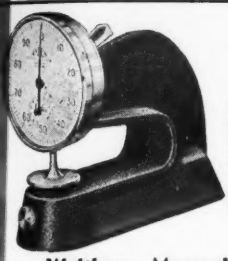

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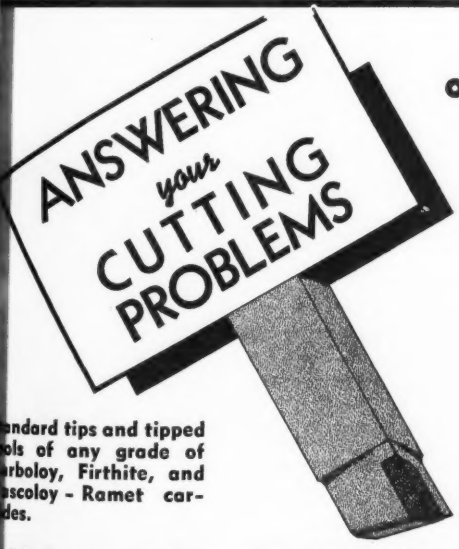

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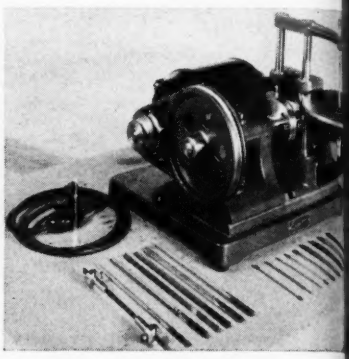
The Type J-40 is an improvement over the previous Type J-4, the J-50 handling a 5-in. wheel in place of the 4-in. wheel previously used. A Themac Pencil Wheel can also be attached directly to the end of the spindle for internal grinding. The J-40 grinder is equipped with a ½ h.p. universal motor which operates on A.C. 25-60 cycle and D.C. of the same voltage.

Elgin Precision Die Filing Machine

The illustration shows a precision die filing machine which is being offered by Elgin Tool Works, Inc., 57 N. State St., Elgin, Ill. The machine will hold of all shapes from the smallest 5/16-in. diameter and from 3½ to in length. The file is supported on ends and can be turned in any



Elgin Precision Die Filing Machi

tion so as to present a new cutting to the work.

The machine will take work up maximum of 6-in. diameter and thick. The table is 5½-in. diameter is adjustable for clearance. The is 2 in. with two speeds availab 325 and 475 reciprocations per m All working parts are hardened ground. The machine is powered enclosed 110 volt, 60 cycle single- motor. Space required is 12x18 in the weight is 75 pounds.

Heim Die Polishing Machi

Designed especially for polishing ing dies, the Heim Die Polishing chine illustrated herewith, produ The Heim Company, Fairfield, makes use of an endless abrasive

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Easy and Economical with Flynn Micrometer Boring Heads.

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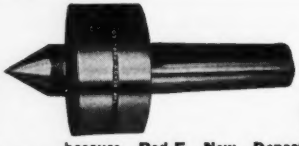

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. . . because Red-E New Departure Ball Bearing Centers are built on double row angular contact PRELOADED precision bearings.

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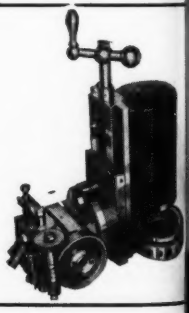

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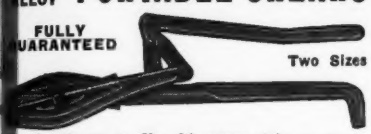

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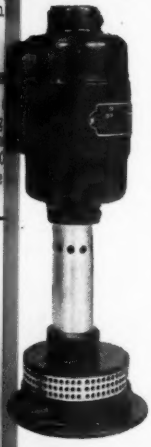

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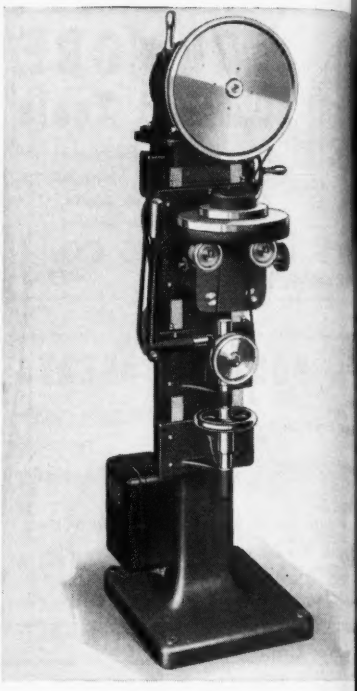
driven at grinding wheel speed. This method of applying the abrasive polishes the die substantially parallel with the line of draw of the work through the die. The method is said to be theoretically correct and imparts a very fine finish to the work. Practically any type of die can be polished on this machine, such as dies used in drawing rods, bars, or tubing, dies for blanking and deep drawing, also oval, hexagon, and square dies with corners which are not too sharp.

The mechanism is mounted on a cast iron column of rigid design. A revolving work support table is mounted on a slide on the front of the column where it is adjusted for height by use of a hand wheel at the side of the column. The abrasive belt is driven by an electric motor positioned at the top of the column. The abrasive belt can be readily be slipped into position and given proper tension imparted to it. A brake is provided by which the machine can



Heim Die Polishing Machine

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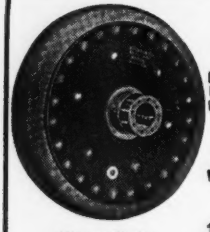

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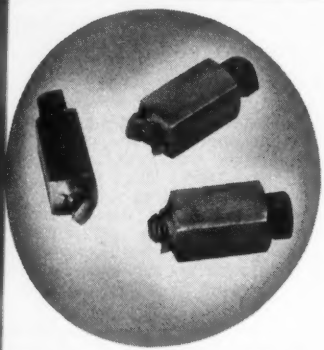

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The machine will handle work ranging from ¼ to 3½-in. diameter. The work table is 9⅞-in. diameter with a 4⅜-in. hole through the center. The work table has two speeds: 60 and 150 r.p.m. Speed of the polishing belt is 5,500 lineal feet per minute. Spindles are of chrome nickel steel, heat treated and ground, and the high speed units are mounted on anti-friction bearings. Floor space required is 18x24 in. and the weight is approximately 600 lbs. Standard equipment includes chucks or adapter plates for holding the dies and a limited supply of abrasive be assorted grades.

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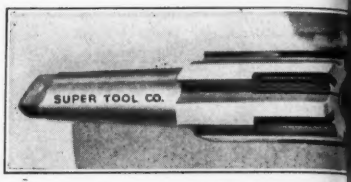

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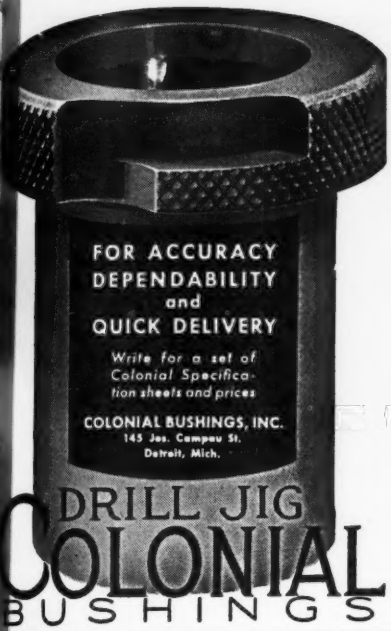

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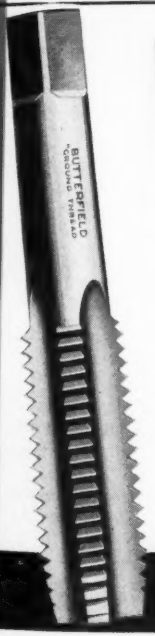
COLONIAL
BUSHINGS



BUTTERFIELD TAPS

Taps are only as good as the threads they produce.

Butterfield High Speed Steel "Commercial Ground" Taps produce "Class 2 Fit" Tolerances until entirely worn out.

Buy Butterfield's accurate threads.

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
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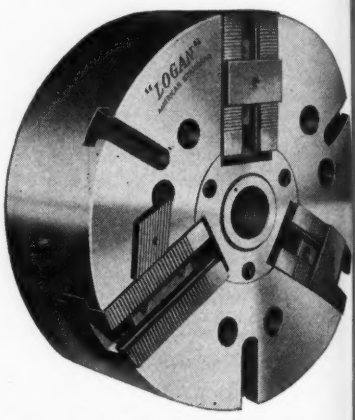
treme accuracy and operating efficiency in heavy duty chucking service.

Among the more important features of the "Logan" Line is the one-piece cast electric steel body, which is used in all models. The "Logan" Chucks Body is cored for light weight and correct balance. Its uninterrupted sidewall, radially reinforced at the points of stress, offers ample resistance to driving and gripping forces; and insures minimum deflection and mis-alignment. As a result, the new "Logan" Chucks combine extra factors of strength and rigidity with extreme compactness and light weight.

Positive pressure lubrication is provided to all working parts to insure long life and efficient operation. "Logan" Models which are provided with pilot bushing supports are complete



"Logan" American Standard Power-Operated Chuck

sealed against dust, abrasives, cutting and other foreign matter. This seal is accomplished by the sliding contact maintained between the master jaw and the under side of the pilot bushing support. The dust-proof seal and the pressure lubrication provide positive protection to all working parts of the chuck.

High quality materials are used throughout. All operating parts are heat treated and precision finished. Jaw operating levers are drop forged chrome nickel steel. Lever pins are nickel steel alloy. Levers, lever block and draw sleeve are designed with extra large bearing surfaces to resist wear and insure accuracy.

DRILL ROD STORAGE RACK

Stores all lengths from 3 feet and shorter. Separate compartments for each size—short pieces easily removed.

3 Models
RACK A: #1 to # 60
RACK B: 1/16 to ½" by 64ths
RACK C: A to Z
Overall Dimensions 3½"x8"x45"
Approx. weight—20 to 30 lbs.

Write for illustrated folder.

CURRAN MACHINE WORKS
3125 45th St.
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Flush type drives in

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OIL CUPS

and Oil Hole Covers
for ALL Types of Machines and Machine Tools.
Made From Brass Rod. With Die Cut Threads.
Special Oilers Made To Order.

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"Established 1899"

APEX UNIVERSAL JOINTS

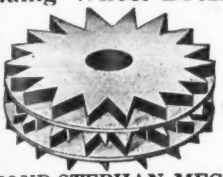
Simple in construction—only five parts. No projecting ears, pins, screws or sharp corners. Exceptionally strong and smooth running. Sizes from ½" to 4" diameter. Alloy steel, heat treated for maximum strength.

Sizes from ½" to 3" carried in stock. We are equipped to bore or machine them to your drawings at a saving to you.

Write for literature and prices.

THE APEX MACHINE & TOOL CO., Dayton, Ohio

Grinding Wheel Dressers



We make all types of Dressers and Cutters

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URBANA, OHIO
The Canadian Desmond-Stephen Mfg. Co., Ltd.
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New Nesting Type Tote Pans

Lots of 50
$1.00 each

20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

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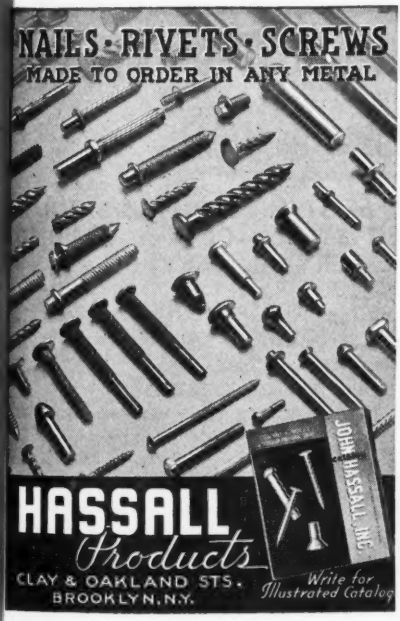
NAILS · RIVETS · SCREWS
MADE TO ORDER IN ANY METAL



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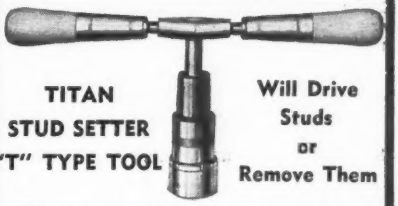
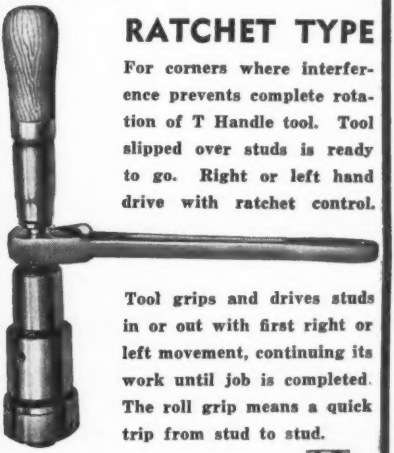
NOW! Set Studs The Roll Grip Way



TITAN STUD SETTER "T" TYPE TOOL

Will Drive Studs or Remove Them

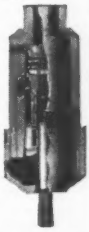
Placed over stud to be set or removed. Slight left or right hand turn effects tight grip on stud. Release is just a matter of reversal accomplished in a split second.



RATCHET TYPE

For corners where interference prevents complete rotation of T Handle tool. Tool slipped over studs is ready to go. Right or left hand drive with ratchet control.

Tool grips and drives studs in or out with first right or left movement, continuing its work until job is completed. The roll grip means a quick trip from stud to stud.



The TITAN drives studs by gripping unthreaded body of stud. It drives studs having as little as ½" of gripping surface. Used as a POWER TOOL it may be driven by electric, air, or machine tool equipment. Write for details.

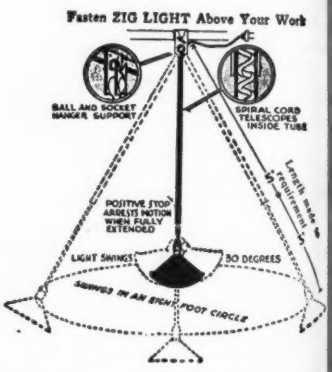
Manufactured under the Kirkland Patent No. 2069527.

TITAN TOOL COMPANY
FAIRVIEW ● PA.

The new "Logan" Chucks mount directly on American Standard spindle noses, Types A and B. The elimination of adapters offers decided advantages—accurate concentricity, simple installation and reduced weight and overhang on the spindle. These chucks may also be used on American Standard Spindles, Type C; but in this case require adapters to accommodate the 2-segment clamp ring used on the Type C spindles.

Zagora Universal Movable Zig-Light

J. Zagora Machine & Gear Co., 1327 S. Mint St., Charlotte, N. C., is now marketing a movable light which, anchoring in the desired location, be pushed up, pulled down, or s around to any desired position. Fas

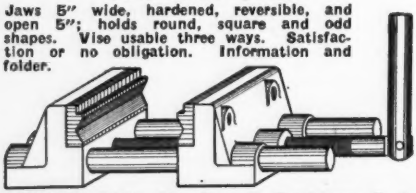

Fasten ZIG LIGHT Above Your Work
BALL AND SOCKET HANGER SUPPORT
SPIRAL CORD TELESCOPES INSIDE TUBE
POSITIVE STOP ARRESTS MOTION WHEN FULLY EXTENDED
LIGHT SWINGS
180 DEGREES
SWINGS IN AN EIGHT FOOT CIRCLE

Zagora Universal Movable Zig-Ligh

in a fixed position to a ceiling or s port, the 5-ft. closed length can be tended three additional feet and can swung in a complete circle having 8-ft. diameter. Two universal joi

A REAL DRILL VISE
FOR ONLY $12.50

Jaws 5" wide, hardened, reversible, and open 5"; holds round, square and odd shapes. Vise usable three ways. Satisfaction or no obligation. Information and folder.



JOHNSON TOOL CO., Inc., E. Providence, R. I.

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Manufacturers of a complete line of STANDARD and SPECIAL TAPS—CARBON or HIGH SPEED STEEL—CUT or GROUND THREAD—PROMPT DELIVERY and SERVICE

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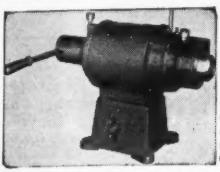
allow movements in all directions, permitting the light to be adjusted so as to eliminate glare on the work.

The cord is arrested in a telescoping tube. The light is simple in construction, neat in appearance, and said to be reliable in performance.

Improved Reich 3-Way Surface Test Indicator

The Reich 3-Way Surface Test Indicator illustrated, product of J. R. Reich Manufacturing Co., 334 Triangle Ave., Dayton, Ohio, is said to be the only in-

IDEAL SPEED LATHES



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FINISHING
POLISHING
SMALL PARTS

2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Cir. 351.

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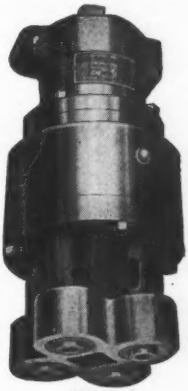
SPEED
IN
DRILLING



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Save 50% to 60% and More on Your Tool and Die Work with an OLIVER of ADRIAN DIE MAKING MACHINE

FAST-ACCURATE-EFFICIENT
on all Sawing, Filing and Lapping Operations

Just the machine you need to *cut those corners* and *turn losses into profits.*

Thousands of machines in use in every part of the world.

Only a $125.00 investment—You cannot afford to operate without it—Order one today. Other models for materials up to 3" thick.

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dicator available which can be read from either side or the end as contrasted with the old method where the operator

Improved Reich 3-Way Surface Test Indicator

either used mirrors or had to get in awkward positions to read the indicator.

The outfit consists of three parts, as illustrated, the indicator itself, one adjustable mounting arm, and a univ holder. Thus it is complete, ready use for a milling machine, jig bo lathe, grinder, surface gage, height g planer or shaper. There are no e holders to be made.

The readings are easily visible, s the graduations are black on a dull p ished steel background and the poi is a bright red. The scale is gradua in thousandths of an inch and ha range of 0.014 in. total movement. T feeler or contact point is 0.110 in. diameter and may be initially set any position within 90 deg. from e side of its neutral position. It is p vided with coni bearings set in justable seats wh are mounted in housing.

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Have you seen the new slide clamp that facilitates setting the Indicator? Ask to see it.
MODEL ONE
Graduated 1/1000"
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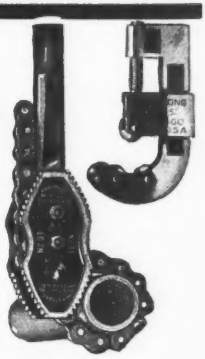
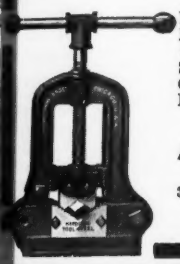
Better PIPE TOOLS . . .

The most complete line of pipe tools made. Built to industrial standards for quality tools, these are better pipe tools, improved in design and action with drop forgings, alloy steels, and hardened parts wherever they will add to performance or life. Handier, stronger, accurately made and finely finished, they make work easier, faster. They comprise the most complete line made, still each is an improved tool.





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Pipe Cutter with Knife Blade Wheels (5 types)
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"The Tool Holder People"
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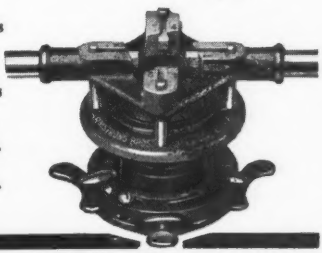

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Sold by MORSE CHAIN CO., Ithaca, N. Y. With offices in principal cities

Planned Units Loads. This four-page folder now being issued by Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, presents a number of interesting photographs showing installations of materials handling equipment in various branches of industry. Copy free upon request.

Light Wave Micrometer. A four-page circular has been issued by The Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass., describing the construction, operation and applications of the improved Van Keuren Light Wave Micrometer manufactured by this firm. The micrometer makes use of light waves to determine the pressure measurement. Copy free upon request.

Brown & Sharpe Automatic Screw Machines. An interesting comparison between new automatic screw machines and those designed 15 years ago, planned to prove that it pays to replace the old machines with new ones, is presented in an eight-page illustrated circular now being issued by Brown & Sharpe Mfg. Co., Providence, R. I. Copy free upon request.

"Extra Protection for Norma-Hoffmann Self-Sealed Bearings" is the title of a circular published by the Norma - Hoffmann Bearings Corporation, Stamford, Conn. The booklet briefly outlines some results of long and extensive study in the Norma - Hoffmann Research Engineering Department with a view to safe-guarding the bearings in the interval between manufacture and actual application.

One result is the use of "Stabilized Tested" Grease in Norma - Hoffmann Precision Sealed Bearings. As further measure of protection is the wrapping of the bearings in glassine-lined aluminum foil to protect the polished bearing surfaces and safeguard the lubricating grease against rapid deterioration.

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for Horizontal or Vertical Mounting
- ROTARY GEARED MOTORPUMPS
Nos. 101 - 102 - 103

Flexible in Installation
Economical and Dependable

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DIAL BORE GAGES

Measure Diametrically Through Center of Bore-The CORRECT Way

Standard Length Type—for measuring the usual variety of bores. Available with length extensions for shallow, medium or deep bores.

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for use in restricted quarters. Dial can be swung to any angle suitable to the operator.

Left — Vertical Type: Clear view of dial when used in vertical position.

Right — Vertical 90° Type: Dial viewed from end of gage.

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STANDARD GAGE CO., INC.

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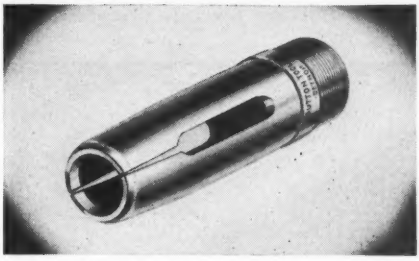
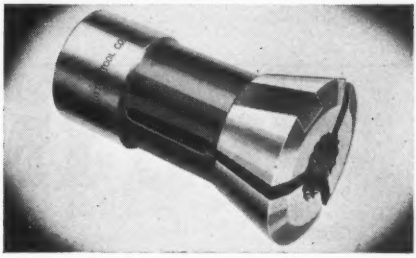


Sutton Feed Fingers



Sutton DIAMOND-GRIP COLLETS

By their perfect partnership Sutton Fingers and Collets improve screw machine production and reduce spoilage. Made from selected steels expertly heat-treated. Accuracy of taper and concentricity of hole and threads insured by special fixtures and by grinding all over on hardened arbors. Single-piece and master types for all machines. Send for complete catalog.

SUTTON TOOL COMPANY

2842 W. Grand Blvd., DETROIT, Mich.

The Landmaco Quadruple Head Threading Machine is the subject of a four-page folder issued by The Landis Machine Co., Inc., Waynesboro, Pa. The machine is designed especially to handle the maintenance and production threading operations of the railroads. Advantages claimed for the machine are close tolerances, increased production and low operating cost.

Copy free upon request.

Buckeye Catalog 137, now being issued by the Buckeye Brass & Manufacturing Company, 6412 Hawthorne Ave., Cleveland, Ohio, lists 787 sizes of ready-to-industrial bushings and 154 sizes cored and solid bars.

Buckeye Catalog "0", also being tributed, lists 268 sizes of electric mo bearings. Copies free upon request.

Walton Tap Extractors. Walton T Extractors are now available in sets 4, 5, and 6 extractors, packed in p ished wood cases. A bulletin now be issued by The Walton Company, Allyn St., Hartford, Conn., gives full d tails. Copy of the bulletin free up request.

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. . . to grind drills on a BLACK DIAMOND Drill Grinder. Now—ANYONE can grind drills accurately. No adjustments are necessary for grinding drills from No. 60 to 3/4". The money you save on a BLACK DIAMOND quickly pays for the machine. Write for Bulletin No. 121.

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SAW & MACHINE WORKS, INC.
45 North Ave. Natick, Mass.

for your Catalog Library

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Strenes Metal

The features of this chrome, nickel, molybdenum alloy with a high steel base used primarily for cast to shape forming and drawing dies are explained in a 4-page bulletin published by Advance Foundry Co., Dayton, Ohio.

2. Speedmill-Midgetmill

Dalrae Tools Co., 501 E. Water St., Syracuse, N. Y., is issuing a 16-page catalog featuring the Speedmill and Midgetmill motor driven attachments for all milling machines.

3. Roller Bearings

Bulletin No. 14 released by The Heim Co., Fairfield, Conn., gives complete specifications and engineering data on Heim self-contained roller bearings for all radial installations.

4. Gear Cutter

The Fellows Gear Shaper Co., Springfield, Vt., has available a new bulletin, detailing the gap-type cutter method for producing accurate gears at low cost.

5. Drill and Jig Borer

A new 16-page catalog is being issued by The Fosdick Machine Tool Co., Cincinnati, Ohio. It illustrates and describes the Fosdick Combination Drill and Jig Borer.

6. Clutches

Complete information about Pullmore Clutches is contained in the Pullmore Blue Book published by the Rockford Drilling Machine Co., 300 Catherine St., Rockford, Ill.

7. Hand Cut Rotary Files

Bulletin No. 105 illustrates the line of Ford Hand Cut Rotary Files. M. A. Ford Mfg. Co., 408 Pershing Ave., Davenport, Iowa.

8. Magnetic Chucks

Circular prepared by Brow Sharpe Mfg. Co., Providence, gives complete information on sizes of magnetic chucks.

9. Hole Gage

Bulletin 25 illustrates and des the Comtorplug for produ gaging of holes to close toler The Comtor Co., Waltham, Ma

10. Tap Extractors

Folder 132, issued by The W Co., 98 Allyn St., Hartford, C gives sizes, styles and prices on ton tap extractors.

11. Block Type Boring Equipment

Bulletin No. 300 illustrates an scribes the Block Type Boring Equipment manufactured by Davis Boring Tool Co., 6200 Ave., St. Louis, Mo.

12. Flexible Couplings

The Baldwin-Duckworth Chain Springfield, Mass., has publi Bulletin No. 63, giving full d on B-D Flexible Couplings.

13. Surface Grinder

The New Reid hand feed su grinder is detailed in Circular released by Reid Brothers Co., Beverly, Mass.

14. Air Control Valves

Catalog No. 37 issued by Ross ating Valve Co., 6484 Epworth Detroit, Mich., illustrates and scribes the line of hand, foot, oid and mechancial control manufactured by this company

15. Motorized Speed Reducers

Janette Manufacturing Co., 556 Monroe St., Chicago, Ill., has lished Bulletin 22-25C giving s fications on Janette motorized reducers from 1/30 to 7½ h.p.